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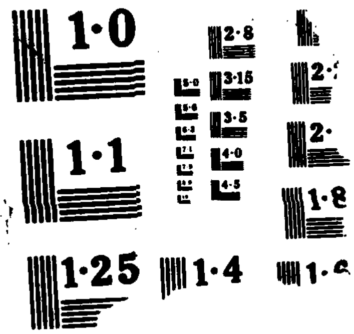
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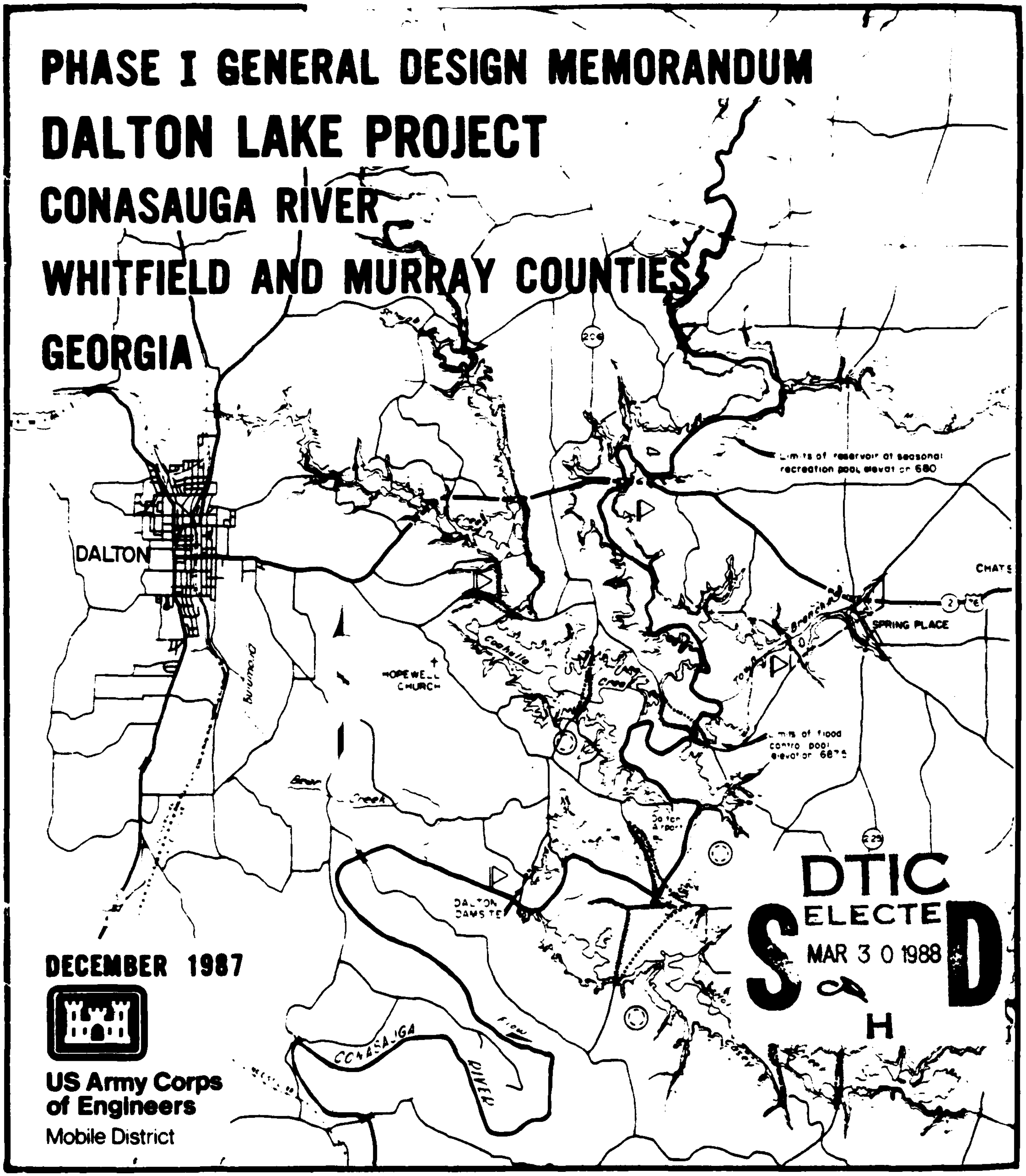
PHASE I GENERAL DESIGN MEMORANDUM

DALTON LAKE PROJECT

CONASAUGA RIVER

WHITFIELD AND MURRAY COUNTIES

GEORGIA



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The report consists of a feasibility analysis of the proposed Dalton Lake multipurpose dam project, as well as evaluations of alternative methods for supplying 51 MGD of water supply to the Dalton and Chatsworth areas of north Georgia.

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PHASE I GENERAL DESIGN MEMORANDUM
DALTON LAKE PROJECT, CONASAUGA RIVER,
WHITFIELD AND MURRAY COUNTIES, GEORGIA

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PHASE I GENERAL DESIGN MEMORANDUM
DALTON LAKE PROJECT, CONASAUGA RIVER,
WHITFIELD AND MURRAY COUNTIES, GEORGIA

INTRODUCTION

1. Authority. This report has been prepared in response to the authorization of the Chief of Engineers to undertake Phase I General Design Memorandum studies of the Dalton Lake project plan contained in the Appalachia Report of September 1969--H.D. 94-436. The Water Resources Development Act of 1974, PL 93-251, dated 7 March 1974, provided the authority for Phase I studies. Title I, Section 1(a), of the 1974 Act states: "The Secretary of the Army, acting through the Chief of Engineers, is hereby authorized to undertake the Phase I Design Memorandum stage of advanced engineering and design of the following multi-purpose water resources development projects, substantially in accordance with, and subject to the conditions recommended by the Chief of Engineers, in the reports hereinafter designated."

> "The project for flood control and other purposes at Dalton Reservoir, Conasauga River, Georgia, in accordance with the recommendations of the Secretary of the Army in his report dated 12 April 1971, on the Development of Water Resources in Appalachia, at an estimated cost of $440,000."

2. Scope of Study and Report. The study performed leading to the preparation of this report was authorized as a "Legislative" Phase I General Design Memorandum (GDM). The concept of such a study was established administratively by the Corps of Engineers in 1971 to provide for reassessment of authorized projects. The basic requirements of "Legislative" Phase I GDM studies include analysis, or reanalysis, of the following elements contained in pre-authorization documentation:

o An updated evaluation of the study area's problems and opportunities.

o An appraisal of current policies and criteria as applied to the project plan.

o A review of alternative plans.

o A reevaluation of benefits and costs.

o An updating of agency coordination, and if appropriate, a reaffirmation of the potential sponsor's intent to provide items of local cooperation.

The analyses presented in this report were made in the 1980 to 1987 time frame, and included the geographic area drained by the Coosa River and its major tributaries within the State of Georgia. Emphasis during the study was given to the reevaluation of the original multi-purpose plan for Dalton Lake, evaluation of alternative multi-purpose

sites, and the identification and evaluation of single purpose non-Federal alternatives to meet the area's future water supply need.

Because this study was authorized as a "Legislative" Phase I GDM, any plan that may be recommended must be authorized by the Congress prior to Federal participation in construction. However, if the project is without controversy and compatible with the original plan, Section 1(b) of the 1974 Act does allow the initiation of Phase II Design Memorandum (DM) work upon transmittal of a favorable Phase I GDM and Environmental Impact Statement (EIS) to the Congress.

3. Study Participants and Coordination. The U.S. Army Corps of Engineers, Mobile District, was responsible for the conduct and coordination of this study. Coordination with Federal, State, and local agencies, as well as local officials and community leaders, was maintained throughout the study process. Principal study participants include the Cities of Dalton and Chatsworth, Georgia, the Georgia State Environmental Protection Division, the Coosa Valley Planning and Development Commission, the North Georgia Area Planning and Development Commission, Dalton Utilities, the Coosa-Alabama River Improvement Association, Inc., the U.S. Environmental Protection Agency, and the Corps of Engineers Hydrologic Engineering Center at Davis, California.

4. Description of the Study Area. The Study Area encompasses the major portion of a four-county area comprising the Upper Coosa River Basin in Northwest Georgia. This five-county area includes the counties: Floyd, Gordon, Walker, Whitfield, and Murray. Excluded from the Study Area is that portion of Whitfield County which is within the Tennessee River Basin. The Study Area is shown in Figure 1.

The City of Dalton is located in the south central segment of Whitfield County. The boundary between Whitfield County to the west and Murray County to the east, is formed by the Conasauga River. The Conasauga River originates in Tennessee and forms the headwaters of the Coosa River Basin. About two miles northeast of Calhoun, Georgia, the confluence of the Conasauga and Coosawattee Rivers form the Oostanaula River. At Rome, Georgia, the Oostanaula and Etowah Rivers come together to form the Coosa.

The Study Area lies within the Ridge and Valley Physiographic Province, and is divided in a north-south direction by the Armuchee Ridges District to the west, and the Great Valley District to the east. The area has a mild, humid climate with long, warm summers and short, cool winters. The average annual temperature is about 60F. Precipitation is normally plentiful in all months of the year, with an average annual of 50 to 55 inches. June through November are the driest months, and January through March are the wettest months.

Population and industrial growth in the Study Area have been at a fairly rapid pace. The carpet industry in the Dalton and Chatsworth areas has had a tremendous impact on this growth. This industry expanded rapidly in the 1960's and early 1970's, with some growth

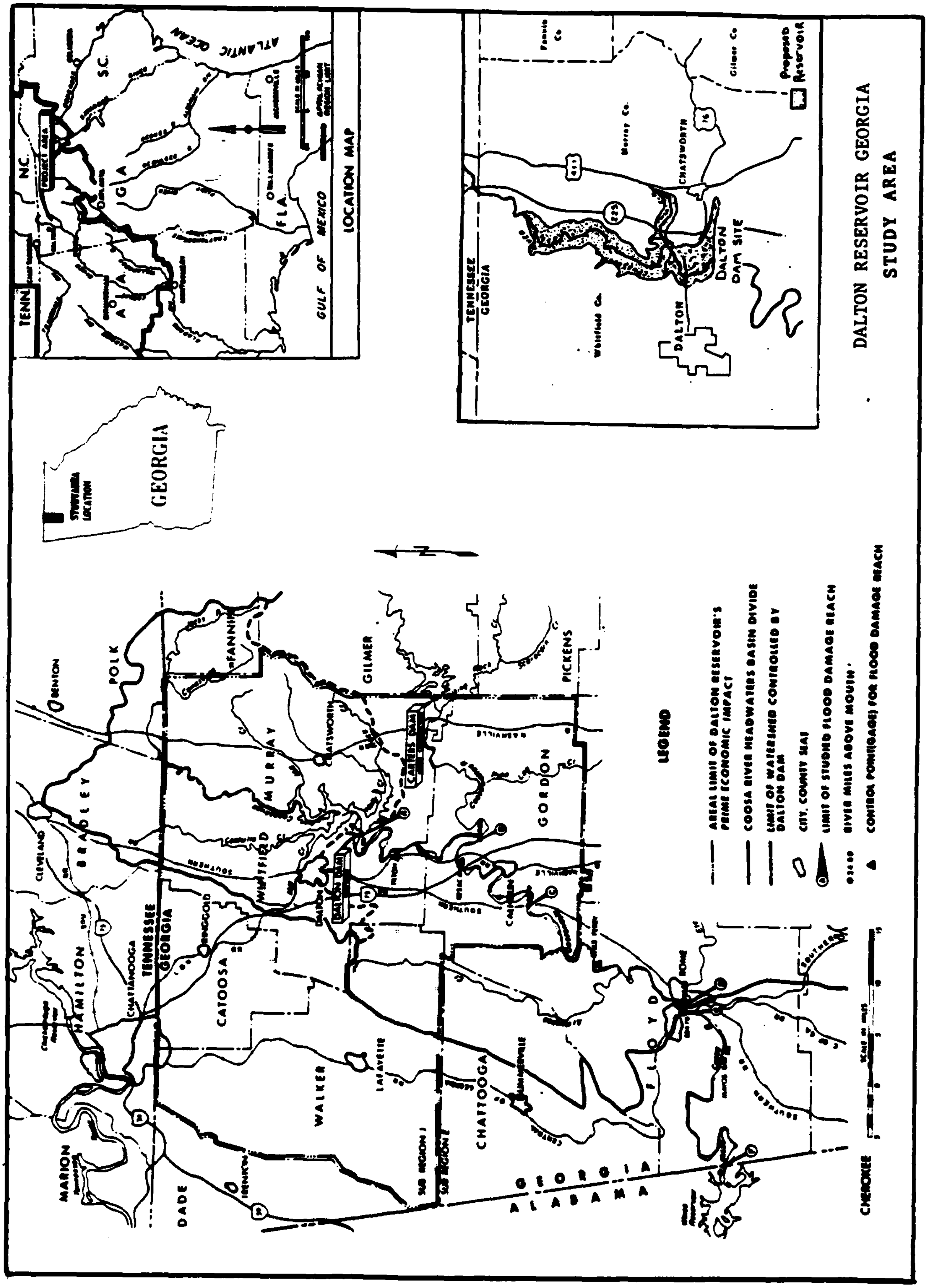

DALTON RESERVOIR GEORGIA
STUDY AREA
LOCATION MAP
GULF OF MEXICO
ATLANTIC OCEAN
GEORGIA
LEGEND
AREAL LIMIT OF DALTON RESERVOIR'S PRIME ECONOMIC IMPACT
COOSA RIVER HEADWATERS BASIN DIVIDE
LIMIT OF WATERSHED CONTROLLED BY DALTON DAM
CITY, COUNTY SEAT
LIMIT OF STUDIED FLOOD DAMAGE REACH
RIVER MILES ABOVE MOUTH
CONTROL POINT(GAGE) FOR FLOOD DAMAGE REACH
TENNESSEE
GEORGIA
ALABAMA
HAMILTON
BRADLEY
POLK
CATOOSA
WHITFIELD
MURRAY
GILMER
FANNIN
GORDON
PICKENS
WALKER
CHATTOOGA
FLOYD
DADE
MARION
CHEROKEE
CHATTANOOGA
CLEVELAND
DALTON
CHATSWORTH
ROME
CALHOUN
DALTON DAM SITE
Proposed Reservoir

FIGURE 1

slump in 1974 and 1975. In all of the four counties, except Floyd, textile mill products account for about 77 percent or more of their employment. Floyd County has a more diversified economy, including paper, allied products, and metals industries. In the Dalton area the carpet industry accounts for approximately 70 percent of the total water use.

The major headwater streams previously mentioned, and many of their tributaries, are the primary sources of municipal and industrial water supply in the Study Area. Streamflows on the Coosawattee-Oostanaula Rivers are regulated by Carters Dam, a multi-purpose Corps of Engineers project located on the Coosawattee River 26.8 miles above its mouth, and about 20 miles southeast of the City of Dalton. Flows on the Etowah River are regulated by Allatoona Dam, another multi-purpose project built by the Corps. Allatoona is located about 43 miles southeast of Dalton, Georgia, and about 3 miles east of Cartersville, Georgia. The Conasauga River is unregulated, and experiences wide variations in flow. Extreme low-flow conditions usually occur in the late summer and fall.

5. <u>Related Studies and Reports</u>. There have been numerous studies and reports prepared by Federal, State, and private sector entities that relate to the Dalton Lake study, or study area. Some of these reports were completed prior to the initiation of this Phase I GDM, others were completed after. Some of the more pertinent reports, which were available during the conduct of this Phase I study, are discussed in the following paragraphs.

In 1967, Mr. Donald F. Smith of the University of Georgia conducted a basic geological survey in the Dalton, Georgia, area. The survey did cover the original Dalton Lake dam site and impoundment area. A report on the survey was prepared which briefly describes the geology and geomorphology of the area.

The Corps of Engineers, as Director of the Office of Appalachian Studies, completed the 1969 report, titled "Development of Water Resources in Appalachia," previously referred to as the Appalachia Report of September 1969--H.D. 94-436. This Appalachian Water Resources Survey was carried out in response to Section 206 of the Appalachian Regional Development Act of 1965 (PL 89-4, 9 March 1965). The plan for water resources development in Appalachia was prepared with Federal, State, local, and private sector cooperation. Preparation and supervision of the report was the direct responsibility of the Office of Appalachian Studies (APS), a specially formed group within the Corps of Engineers, operating under the Ohio River Division Engineer. Overall study guidance was provided by the Offices of the Secretary of the Army and the Chief of Engineers, and also by the Water Development Coordinating Committee for Appalachia (WDCC).

The 1969 report consists of 25 volumes. Contained in Volume 8, Chapter 8, is an analysis and original project plan for the Dalton Lake multi-purpose project. The project site is shown on the Conasauga River about 6 miles southeast of the City of Dalton, just

downstream from the confluence of Holly Creek. Further description and discussion of the project is included later in this report.

The U.S. Fish and Wildlife Service (USFWS) completed a study on the status of the amber darter and trispot darter found in the upper Coosa River System in Alabama, Georgia, and Tennessee. The study was prepared by Byron J. Freeman of the University of Georgia Museum of Natural History at Athens, Georgia, under contract to the USFWS. The report was completed in 1983, and it identified critical habitat, management and recovery actions, and further research needs for both darters. The report also discussed the need for further research into the life history and habitats of a third small fish, the "reticulate logperch."

As a response to the listing of the amber darter and Conasauga logperch (previously referred to as the "reticulate logperch") as endangered species in the 5 August 1985 Federal Register (50 FR 31597), Richard G. Biggins of the U.S. Fish and Wildlife Service Southeast Region, Atlanta, Georgia, prepared a Recovery Plan Report. The report, dated December 1985, delineated reasonable actions which the Service believes to be required to recover and/or protect the two species. The report concluded that recovery of both the amber darter and Conasauga logperch into a viable number of populations (reproducing populations that are large enough to maintain sufficient genetic variation to enable them to evolve and respond to natural habitat changes) was an unrealistic goal to pursue. Protection of their existing critical habitat was determined the most essential action to take.

The Georgia Environmental Protection Division of the Department of Natural Resources published a report titled "Innovative Land Treatment System in Dalton, Georgia." The report, written by Robert S. McWilliams, Jr., describes a land treatment plan to handle the entire City of Dalton's wastewater treatment needs. Construction of the system began in the spring of 1982 and is expected to be completed in 1988. The treatment facility is being developed, and will be operated by Dalton Utilities. It is one of the largest municipal sewage land application systems in the nation. The project will eventually encompass over 9,000 acres on the east bank of the Conasauga River in the vicinity of Loopers Bend, just downstream from the mouth of Holly Creek.

Two other reports related to water supply and wastewater treatment in the study area were prepared for the City of Chatsworth. The first of these two reports is titled Chatsworth, Georgia-201 Facilities Plan for Wastewater Management." It was prepared by Wiedeman and Singleton Engineers, and is dated January 1984. The second report is titled "Engineering Report on Proposed Improvements to the City of Chatsworth Water Pollution Control Plant," and was prepared by G. Ben Turnipseed Engineering. This second report is dated May 1985. It addresses both the need to improve the quality of effluent being discharged into Holly Creek at Chatsworth, and alternative plans to expand the overall capacity of the existing plant. Other reports available during this study included:

(1) Georgia Department of Natural Resources, Water Availability and Use, Coosa River Basin, 1982.

(2) Pierce, Robert R. et al., Georgia Department of Natural Resources, Water Use in Georgia by County for 1980. Information Circular 59, 1980.

(3) U.S. Geological Survey, Georgia Irrigation, 1970-80: A Decade of Growth. Water Resources Investigations Report 83-4177, 1984.

(4) U.S. Army Corps of Engineers, Mobile, Carters Reservoir, Reservoir Regulation Manual, Appendix H, July 1979.

(5) Georgia Department of Natural Resources, Coosa River Basin, Water Quality Management Plan, 1978.

(6) U.S. Geological Survey, Low Flow Frequency of Georgia Streams, 1983.

(7) U.S. Geological Survey, Water Resources Data, 1983.

Several investigations conducted as part of this Phase I study resulted in the following supplemental reports being prepared:

(1) Rogers, Herbert H., Municipal and Industrial Water Use, Dalton Lake, Georgia. U.S. Army Engineer District, Mobile, September 1981.

(2) U.S. Army Corps of Engineers, Hydrologic Engineering Center, Davis, California, Water Supply and Use, Dalton Lake, Georgia, May 1986.

(3) U.S. Department of the Interior, Fish and Wildlife Service Division of Ecological Services, Dalton Lake Project, Georgia, Resource Inventory, July 1984.

(4) Georgia Department of Natural Resources, Environmental Feasibility Assessment on Use of Holly Creek as a Regional Water Supply, December 1986.

Further discussion of the above listed reports is presented later in this report. The extent of the investigations, and the pertinent findings of each report, are included in those discussions.

ORIGINAL DALTON LAKE PLAN

6. Project Purposes. As mentioned earlier in this report, the original plan for the Dalton Lake project, as referenced in the 1974 Water Resource Development Act, was presented in the Appalachia Report of 1969. That plan called for a dam and reservoir for flood control, water quality control, water supply, outdoor recreation, fishery and waterfowl enhancement, and economic development.

More than one-fourth of the reservoir storage was planned to serve the combined needs for water supply in and near the City of Dalton, and for water quality control in the Conasauga River, as well as water quality on the Oostanaula River at Calhoun and Rome. Both the City of Calhoun and Rome take their water needs from the Oostanaula River. Also, flood damages were to be considerably reduced along about 73 miles of the river system downstream from the proposed dam. Farms in the valleys of the Conasauga and Oostanaula Rivers, as well as the urban centers of Calhoun and Rome, would benefit from the proposed project. The reduction of flood stages would have also resulted in removing acreage from the flood plain which would become available for future development. But, considering the acreage required for the project pool area, the net available for future development would be very small.

Extensive new opportunities for water-related recreation were planned to be provided by the lake, with its long irregular shoreline. General outdoor recreation needs were planned to be met on project lands. Lake fishing facilities and angler sites on the river reach below the dam were also to provide a substantial gain in fishing opportunities. Also, project-occasioned works were planned to conserve existing trout fisheries in the streams emptying into the lake. Some of the existing hunting opportunities would have been lost as a result of project construction; however, measures included in the project plan, including intensive management of 6,300 acres for upland game and water fowl, would have been implemented to mitigate those losses.

Economic development attributable to project construction was estimated to result in additional job opportunities. These opportunities were forecasted to occur both during and after project construction.

7. Design. The original Dalton Lake plan called for a dam on the Conasauga River at a point 24.8 miles above the mouth, just downstream from the confluence of Holly Creek at Loopers Bend. The dam was to consist of a gated spillway structure flanked by two concrete non-overflow sections. Additionally, both concrete sections would be tied into natural high ground by earthfill sections. The dam was to have a total length of 2,394 feet, and its maximum height was designed to be 85 feet above the riverbed. Twelve tainter gates (each 42 feet long and 24 feet high) on a broadcrested concrete sill (crest elevation 666 feet NGVD), and a 5-foot by 8-foot sluice (intake invert elevation 635 feet NGVD), would both serve to regulate outflows from the reservoir.

The original plan called for a maximum conservation pool at elevation 680 feet NGVD. At this elevation the reservoir pool would have had an area of 8,650 acres, and a total storage capacity of 220,000 acre-feet. Of this 220,000 acre-feet, 85,600 acre-feet (between elevations 680 and 664) was allocated to water quality, water supply, and recreation purposes. Below elevation 664 feet NGVD, 24,400 acre-feet was allocated for sediment and inactive storage.

Flood control operations would have taken advantage of a seasonal operation of the conservation pool between elevations 680 feet NGVD and 671.5 feet NGVD. Primary flood control storage provided between elevations 671.5 and 687.5 was designed to contain 131,000 acre-feet of volume. An additional storage above elevation 687.5 would also have been available for induced surcharge operations. This added measure of storage, above the reservoirs capacity to control a 4-inch basin-wide rainfall, would result in 82,000 acre-feet of flood water in the surcharge zone before the spillway gates would be fully opened. The 82,000 acre-feet of surcharge storage would add to the 131,000 acre-feet to result in controlling about 6.5 inches of basin-wide runoff. A 50-year flood above the reservoir (equivalent to about 8.1 inches of runoff, or the January 1947 flood) would result in a peak pool elevation of about 689.8 feet, or 0.2 feet below the top of the spillway gates.

8. Real Estate. The proposed guide taking line for the original project was at the 694-foot contour, or at a line located 300 feet horizontally from the 687.5-foot contour, whichever would result in a greater project area. The 694-foot contour is 6.5 feet above the normal full pool, and acquisition to this elevation would have provided one foot in reservoir level above the induced-surcharge pool elevation.

The total joint-use land area proposed for acquisition was 17,500 acres, which included 75 acres for the dam and spillway structures. An additional 2,000 acres above the guide taking line were to be acquired for intensive recreational development. Also, 12 acres were to be acquired below the dam for fisherman access and boat launching purposes. To offset hunting losses, which would result from the inundating of project lands, it was additionally proposed that another 4,200 acres suitable for upland game and waterfowl habitat be acquired. All project land, a total of about 23,700 acres, was to be purchased in fee.

9. Costs. The total first cost of constructing the original Dalton Lake project was previously estimated to be 44.3 million dollars. This includes $39.5 million for the dam and reservoir, with initial development for recreation, and $4.8 million for a future incremental development of recreational facilities. This estimate of project first cost includes construction costs, contingencies, engineering and design, and the cost of supervision and administration. Unit prices used in this cost estimate were based on prices for similar work performed in nearby areas and were adjusted to July 1967 price levels. Contingency allowances amounted to 15 percent of the cost for lands, damages, resettlement, relocations, reservoir preparation, and recreation facilities. The contingency allowance used for the dam and appurtenances was 25 percent. Table 1 summarizes the estimated first costs for the original Dalton Lake project plan, as presented in the 1969 Appalachia Report.

TABLE 1

SUMMARY OF PROJECT FIRST COSTS
ORIGINAL DALTON LAKE PROJECT PLAN
(July 1967 price levels)

Cost Account No.	Project Feature	Estimated Cost (1,000 dol.)
01	Lands and damages	8,700
02	Relocations	14,850
03	Reservoir	1,090
04	Dam and appurtenances (incl. access roads)	7,860
06	Wildlife mitigation and enhancement	40
14	Recreation Facilities:	
	Initial development	1,830
	Future increment	4,110
19	Buildings, grounds, and utilities	400
20	Permanent operating equipment	140
30	Engineering and design	3,039
31	Supervision, inspection, and overhead	2,241
	Total, estimated project first cost	44,300
	Less future recreation increment	4,800
	Total, estimated initial first cost	39,500

Total investment costs and annual financial charges were developed using the previously presented project first costs. Investment cost are the first costs, plus interest on the latter over the period of construction (Interest During Construction--IDC). The amount of interest was computed on an annual rate of 3.25 percent and a construction period of 4 years. Average annual charges were computed using the total investment costs interest rate at the time of reporting of 3.25 percent, and an amortization period of 100 years. Operation and maintenance charges for the proposed development were based on expenditures for similar projects, as was the cost of major replacements. Table 2 presents the estimated annual financial and economic cost for the original project plan, as shown in the 1969 report.

TABLE 2

SUMMARY OF ANNUAL COST
ORIGINAL DALTON LAKE PROJECT PLAN
(July 1967 prices, 3.25 percent interest, 100-year life)

Item	Annual Cost Financial ($1,000)	Annual Cost Economic 1/ ($1,000)
INITIAL PROJECT		
Interest on gross investment	$1,367	$1,449
Amortization of gross investment	58	54
Operation and Maintenance	208	208
Major Replacements	28	28
Total Initial Project Cost	1,661	1,739
FUTURE PROJECT		
Interest on investment	79	79
Amortization of investment	3	3
Operation and Maintenance	183	183
Major Replacements	20	20
Total Future Project Cost	285	285
TOTAL PROJECT ANNUAL COST	$1,946	$2,024

1/ Includes adjustments for salvage values and economic losses in: net loss of land productivity, associated cost, and loss of hunting opportunities.

10. Benefits. The original Dalton Lake project plan was developed to provide economic benefits to both the Nation (National Economic Development Benefits--NED) and to the project region (Regional Economic Development Benefits--RED). Table 3 summarizes these benefits and indicates the Dalton project would result in total NED benefits of $7,533,000 (according to the analyses performed for the 1969 Appalachia Report).

TABLE 3

SUMMARY OF ECONOMIC BENEFITS
ORIGINAL DALTON LAKE PROJECT PLAN
(using a 3.25 percent interest rate and 100-year project life)

Category and Class of Benefits	Annual benefits, in thousand dollars				
	National Account Only	Regional Account Only	National and Regional Account	Total National Account	Total Regional Account
User benefits:					
Water supply	-	-	195	195	195
Water quality control	-	-	163	163	163
Flood control and land enhancement	-	-	443	443	443
Recreation	200	-	1,758	1,958	1,758
Total user benefits	200	-	2,559	2,759	2,559
Expansion benefits:					
Redevelopmental 1/	-	360	104	104	464
Developmental 2/	-	157,465	4,670	4,670	162,135
Less adjustment for secondary cost	0	2,500	0	0	2,500
Total, expansion benefits	-	155,325	4,774	4,774	160,099
TOTAL USER & EXPANSION	N/A	N/A	$7,333	$7,533	$162,658

1/ Based on two of the five counties comprising the area of prime project impact having substantial and persistent unemployment rates and were, therefore, designated as redevelopment areas under PL 89-136 (Murray and Walker Counties). But, due to the fact that all five counties lay within the Appalachian Region, the original study criteria allowed them all to be designated as redevelopment areas (Murray, Walker, Floyd, Whitfield, and Gordon).

2/ Developmental benefits are based on unemployed or underemployed finding employment in the developing economy stimulated by the project.

11. Economic Feasibility. The benefit-to-cost ratio shown in the 1969 report on the original Dalton Lake project plan was 1.40. This ratio was derived using the annual user economic benefits to the national account of $2,759,000, plus the expansion benefit for project redevelopment of $104,000 divided by the total project annual economic cost of $2,024,000:

$$\frac{\$2,863,000}{\$2,024,000} = 1.4$$

Excluded from this computation were the expansion development benefits shown in Table 3, as $4,670,000 to the NED account. These type economic benefits are based on projections of future economic activity with wide confidence limits, and are not generally used in computing project benefit-to-cost ratios.

It is important to recognize, that of the $2,863,000 of NED benefits used in the project B/C ratio, that $1,958,000 resulted from recreation benefits. Without these benefits the project B/C ratio would have been:

$$\frac{\$\ 905,000}{\$2,024,000} = 0.45$$

ALTERNATIVE MULTI-PURPOSE PLANS

12. General Site Considerations. In the 1969 Appalachia Report seven sites were considered in detail as possible multi-purpose dam locations. These sites were:

- Upper Jacks River (86 sq. mi.)
- Lower Jacks River (94 sq. mi.)
- Mitchell Bridge (252 sq. mi.)
- Coahulla Creek (113 sq. mi.)
- Dalton (624 sq. mi. original plan)
- Lower Conasauga (649 sq. mi.)
- Carters Lake (376 sq. mi existing project)

13. Screening Site Alternatives. Screening of these seven sites and comparison of their relative suitability resulted in the conclusion that four sites should be studied in more detail. These four sites were: Dalton on the Conasauga River (original plan), Coahulla Creek just east of Dalton, Mitchell Bridge on the Conasauga River, and the Upper Jacks River alternative. Data on these four sites were developed in greater detail. This included performing field surveys and soil borings. For each site, project cost estimates and evaluations of project benefits were made, which included analyses of three heights of dam to determine the optimum economic scale of development (sizing that would provide the maximum annual net benefits).

It was determined, through the above described analyses, that the annual net benefits at the Upper Jacks River and Coahulla Creek sites would be relatively small compared to the other two potential sites. It was further determined that the net annual benefits from a multi-purpose project at the Dalton site (original plan) would be greater than those possible at the Mitchell Bridge site. This difference in net benefits was due to the smaller storage volume available at the Mitchell Bridge site (a constraint of local topography). Lake volume would not be available in sufficient quantity to provide for flood control, water quality, recreation, and water supply storage at the same levels possible at the Dalton site (original plan). Benefits at the Mitchell Bridge site were computed based on providing no flood control, and a reduced level of water quality storage. The preliminary values for

costs and benefits at each of the final four dam sites are shown in Table 4, as presented in the 1969 Appalachia report.

TABLE 4
SUMMARY OF PRELIMINARY ECONOMIC
ANALYSES OF ALTERNATIVE SITES
(Multipurpose Plans As Analyzed in 1969 Report)

	Dalton ($1,000)	Mitchell Bridge ($1,000)	Coahulla Creek ($1,000)	Jacks River ($1,000)
Annual Benefits				
Water Supply	$ 195	$ 195	$ 105	$ 125
Flood Control	443	-	-	-
Water Quality	163	82	-	-
Recreation	1,960	1,960	540	285
Expansion Benefits 1/	4,771	3,661	1,397	1,735
Total Annual Benefits	$7,532	$5,898	$2,042	$2,145
Total Annual Costs 2/	2,011	1,482	558	1,470
Total Net Benefits	$5,521	$4,416	$1,484	$ 675

1/ Includes Development and Redevelopment Benefits.
2/ Includes IDC, O&M, major replacements, and net loss of land productivity.

In addition to the economic considerations presented in Table 4, there are other decision factors that favor the Dalton site. The Dalton dam site (original plan discussed previously in this report) is located at a point on the Conasauga River that drains 624 square miles of basin area. The Mitchell Bridge site is located about 13 miles upstream from the Dalton site, and would receive runoff from only 252 square miles of drainage area. Due to this fact, and site topographical effects on total storage volume, the storage available to non-water supply purposes is large at the Dalton site. This additional volume provides more flexibility at the Dalton site to reallocate storage between purposes, if future demands vary significantly from those forecasted. Also, although not always advisable, response to a drought of unanticipated magnitude could utilize this storage flexibility.

It was for the previously stated reasons that the original Dalton dam site was chosen in 1969 as the most desirable location for the multipurpose project.

REEVALUATION OF ORIGINAL DALTON LAKE PLAN

14. Background. In reviewing the original Dalton Lake project plan, selected in the Appalachia Report, it should be noted that water resource project evaluation procedures and policies have changed considerably since its development during the late 1960's. Also since that time, significant environmental constraints have been identified in the study area. Additionally, with the completion of the Carters Lake Project (1975) in the competing recreational market area, there has been

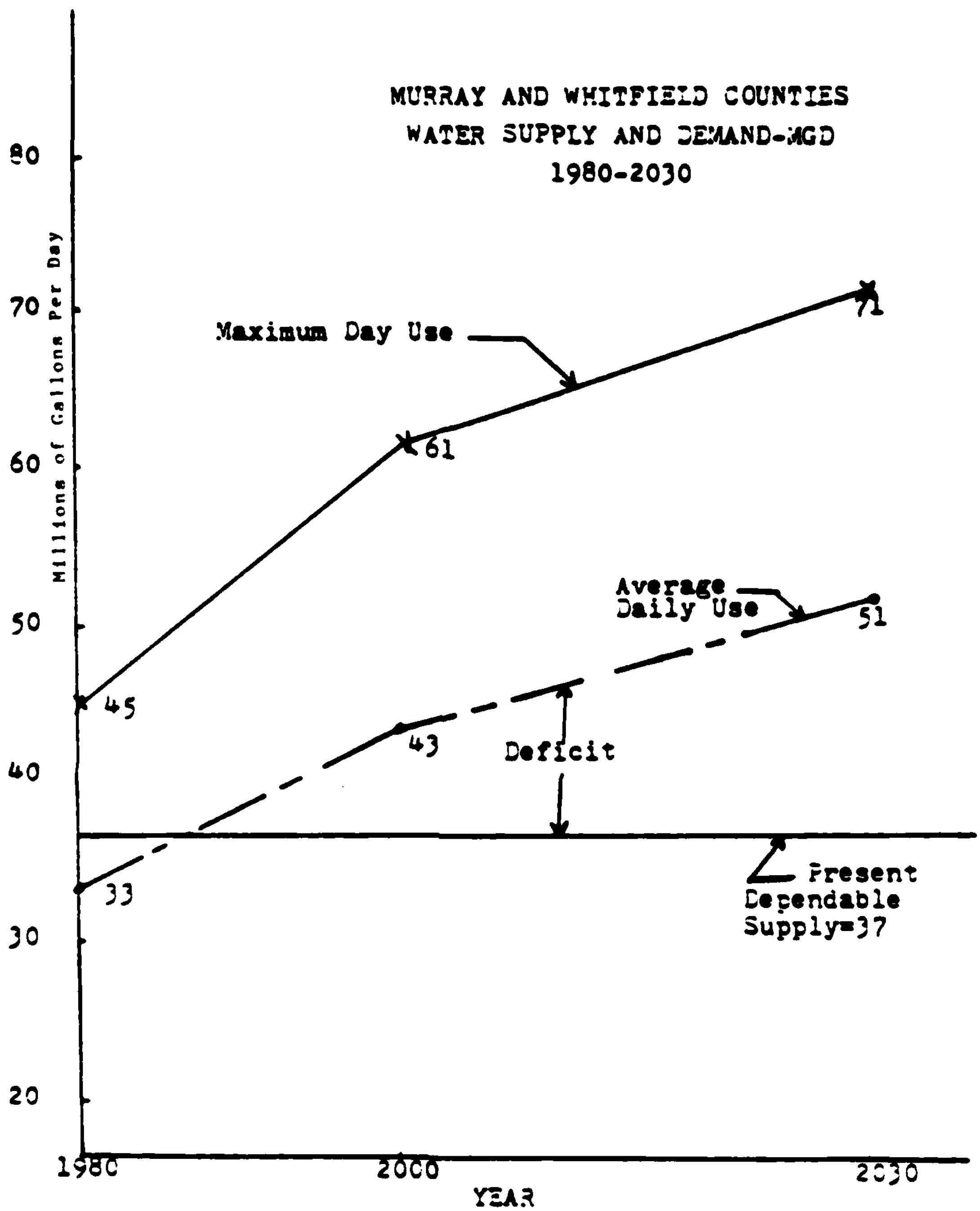
a decline in the overall unmet needs for outdoor recreation within the region. Coupled with these factors is the fact that construction costs and interest rates have risen substantially since the 1969 report was prepared.

15. Reassessment of Needs. With the recognition that much has changed in the study area, a reassessment of the problems and opportunities addressed by the original Dalton Lake project plan was made. The following paragraphs discuss these needs.

The original plan addressed flood damages at the urban centers of Calhoun and Rome, Georgia, and on the farmlands between Dalton and Rome. These flood conditions have been abated to some degree with the completion of the Carters Lake Project. The Carters Project is designed primarily for flood control and hydroelectric power generation. The lake increases flood protection to farm lands and major urban areas along the Coosawattee and Oostanaula Rivers. Peak flood stages are reduced as far downstream as 73 miles, to include the Cities of Calhoun and Rome, Georgia. Flow regulation, recreation, fish and wildlife conservation, and water quality control are also benefits of Carters Dam. In the Dalton-Rome growth area, sufficient land is available outside the flood plain for projected industrial, commercial, and residential expansion. Further flood control, however, could create a climate for more intensive agricultural use on flood plain lands.

Water use in the Dalton-Chatsworth area is high because of the preponderance of the carpet industry. This industry, as stated earlier, accounts for about 70 percent of the total water use in the Dalton area. An extensive analysis of water needs and use was performed, as part of this study, by Herbert H. Rogers under contract to the Corps. His report, which is referenced earlier in this text, concludes that present dependable supply for the Dalton-Chatsworth areas of Murray and Whitfield County is about 37 million gallons per day (MGD). Deficits between this supply and average daily use could possibly begin occurring as early as 1986. This deficit, or water supply need, would total about 6 MGD in the year 2000 and about 14 MGD by the year 2030. Total water needs in this area would be approximately 43 MGD in the year 2000, and about 51 MGD by the year 2030. The growth of these needs and the level of existing supplies is depicted in Figure 2. The need for water supply is the single most critical water resource problem within the study area. This fact was highlighted during recent (1986) drought conditions in the southeast. The growth and continued prosperity of the Dalton-Chatsworth area is integrally tied to the cost and availability of municipal and industrial (M&I) water supplies.

Completion of the new Dalton land treatment facility, near Loopers Bend on the Conasauga River just southeast of Dalton, will ease the once severe waste loadings which emptied into the Conasauga from the City's old Drowning Bear Creek waste treatment plant. The original Dalton Lake project plan called for water quality storage to provide flow



Source:
Municipal and Industrial Water Use, Dalton Lake, Georgia, Herbert H. Rogers, September 1981, page D3.

FIGURE 2

augmentation (dilution water) in the Conasauga River. Previously, even with 85 percent of Dalton sewage BOD removed, effluent volumes from the treatment plant exceeded the river's assimilative capacity during dry seasons.

The original project plan did not include hydroelectric power generation facilities, although the 1969 report did state that there was a demand for hydropower generation in the basin. The construction of Carters Dam has met a significant part of this demand, but there still remains some hydropower need in the region. Therefore, this reevaluation will address the original project as formulated, with the addition of hydropower facilities which are generally compatible with the original project plan.

Although there is some demand for outdoor recreation in the study area, as has been stated, the completion of Carters Lake has resulted in a significant reduction in unmet needs. This reduction, along with other factors affecting demand, is reflected in the needs reported for the area in the most current State Wide Outdoor Recreation Plan (SCORP-1981). Reanalysis of project recreation facilities and benefits was based on the Georgia 1981 SCORP.

16. Basis of Analyses. It was determined that the reevaluation of the original project plan, as shown in Figures 3 and 4, would be performed on the following basis:

- Structural design of the project would be updated to reflect changes in the technical criteria for the period 1969-1986, particularly the spillway design.

- The revised cost estimate would be made on the basis of material quantities shown in the 1969 report, but using October 1981 price levels and any new quantity estimates resulting from necessary structural design changes.

- A new real estate appraisal for project lands would be conducted and costs updated.

- A new flood damage survey would be performed.

- A U.S. Fish and Wildlife Service environmental resource inventory would be made to determine project impacts.

- A new municipal and industrial water supply needs assessment would be made using population and employment forecasts provided by the Bureau of Economic Analysis, U.S. Department of Commerce.

- The addition of hydropower facilities (3-5 MW units) would be included in the plan.

- A new assessment of recreation resource needs based on the 1981 Georgia SCORP would be made. Also, revised recreation benefit computations would be made using new Corps' criteria.

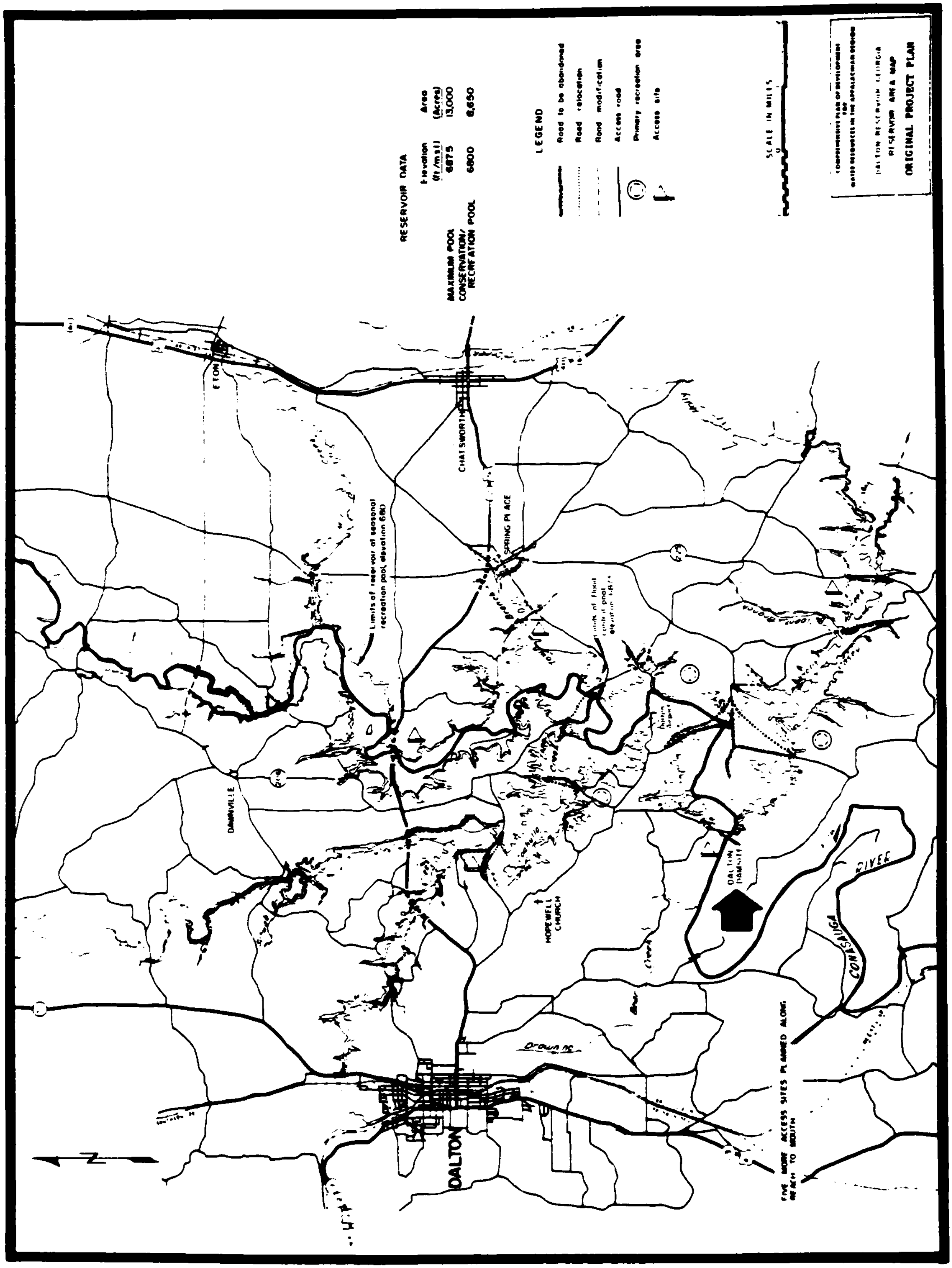

RESERVOIR DATA
MAXIMUM POOL
CONSERVATION/ RECREATION POOL
LEGEND
Road to be abandoned
Road relocation
Road modification
Access road
Primary recreation area
Access site
SCALE IN MILES
ORIGINAL PROJECT PLAN
ETON
CHATSWORTH
SPRING PLACE
DAWNVILLE
HOPEWELL CHURCH
DALTON
DALTON DAMSITE
CONASAUGA RIVER
FIVE MORE ACCESS SITES PLANNED ALONG REACH TO SOUTH

FIGURE 3

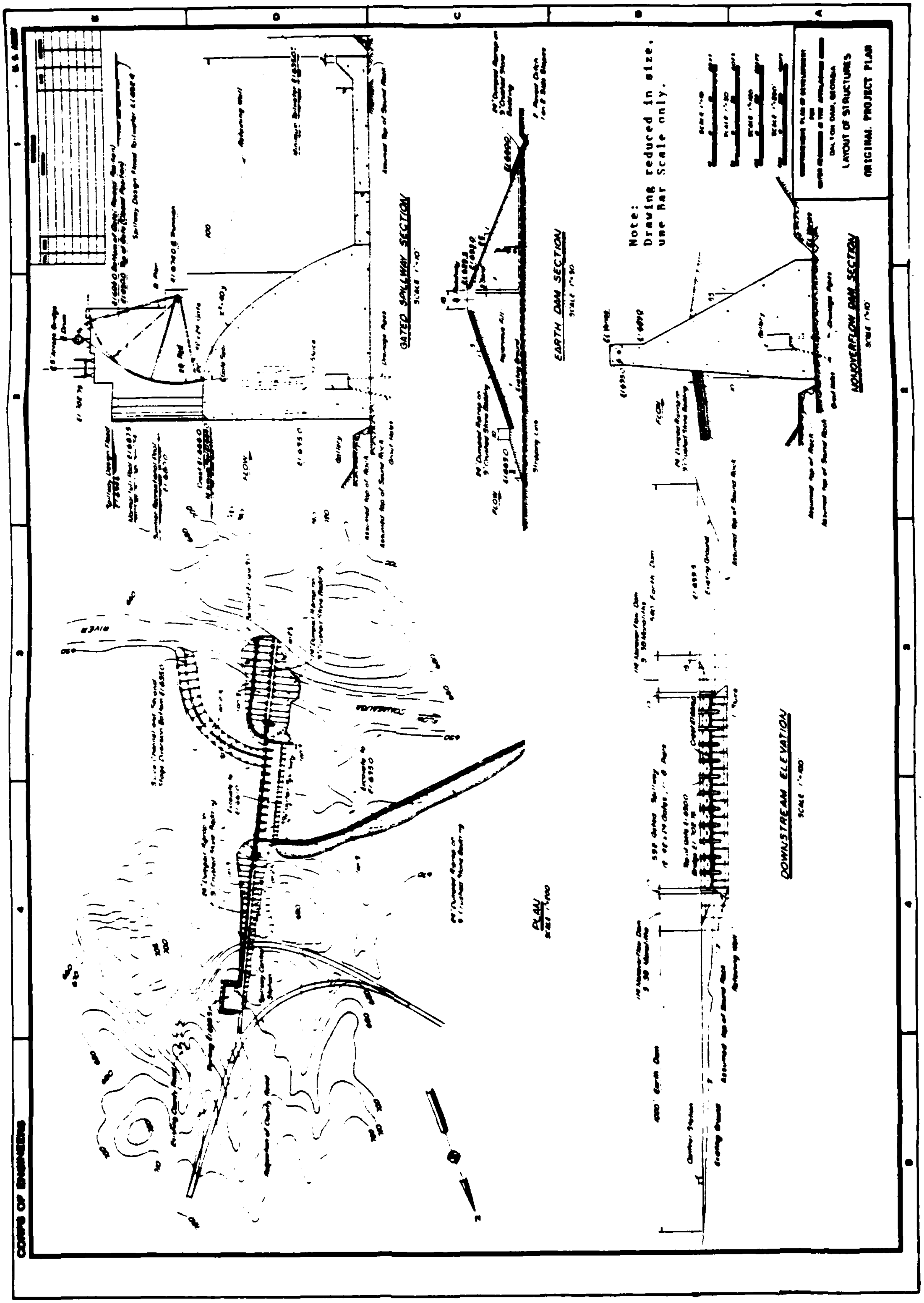

CORPS OF ENGINEERS
GATED SPILLWAY SECTION
EARTH DAM SECTION
NONOVERFLOW DAM SECTION
PLAN
DOWNSTREAM ELEVATION
Note:
Drawing reduced in size,
use Bar Scale only.
LAYOUT OF STRUCTURES
ORIGINAL PROJECT PLAN

FIGURE 4

o The project hydrology would be updated to obtain a new estimate of probable maximum precipitation and spillway design flood.

The reevaluated original Dalton Lake project plan, due to the above changes, was termed the "Modified Plan."

17. Costs. The total first cost of construction was estimated based on October 1981 price levels, and is shown for major project features in Table 5. The total project first cost for the Dalton Lake modified plan was estimated to be $178,070,000. No estimate of the cost of fish and wildlife mitigation measures, or the cost of any cultural resource preservation plans, were made for this evaluation. The process of identifying and quantifying these type of project impacts, and determining mutually acceptable mitigation measures, is a long and costly undertaking. Preliminary assessments of plan feasibility were not favorable; therefore, these more detailed study elements were delayed until the benefit-to-cost ratio indicated the plan was economically feasible.

TABLE 5

SUMMARY OF PROJECT FIRST COSTS
MODIFIED DALTON LAKE PLAN (Original Site)
(October 1981 price levels)

Cost Account No.	Project Feature	Estimated Cost 1/ ($1,000)
01	Lands and Damages	$ 91,500
02	Relocations	16,500
03	Reservoir	6,375
04	Dam and Appurtenances	24,111
06	Wildlife Mitigation	(not determined)
07	Hydropower	12,925
08	Roads, Railroads, and Bridges	116
14	Recreation Facilities	4,236
18	Cultural Resource Preservation	(not determined)
19	Buildings, Grounds, and Utilities	1,353
20	Permanent Operating Equipment	464
	Subtotal	$157,580
30	Engineering and Design (10%)	15,758
31	Supervision and Administration (6%)	9,455
50	Construction Facilities 2/	N/A
	Total Estimated Project First Cost	$182,793

1/ Costs shown for items 01, 03, 04, 06, 07, 08, 14, 18, 19, and 20 include allowances for 25% contingencies.

2/ Included in contractors field overhead as % of construction costs.

Total project investment costs, which include project first costs plus IDC, are shown in Table 6. The IDC was computed assuming a five-year construction period, with mid-year equal annual expenditures ($36,558,600 each), and using a 8-7/8 percent interest rate. Total project investment cost is estimated to be $227,727,000.

TABLE 6

SUMMARY OF INVESTMENT COST
MODIFIED DALTON LAKE PLAN
(5-year construction, 8-7/8 percent interest)

Item Description	Costs ($1,000)
Total Project First Cost (from Table 5)	$182,793
Interest During Construction (IDC)	44,934
TOTAL PROJECT INVESTMENT COST	$227,727

Annual charges for the "Modified Plan" were computed based on a 8-7/8 percent interest rate, and a 100-year project life. Operation and maintenance costs were derived from similar project costs for the region. Shown in Table 7 are the annual charges for the plan estimated at $20,327,000.

TABLE 7

SUMMARY OF ANNUAL CHARGES
MODIFIED DALTON LAKE PLAN
(8-7/8% interest, 100-year project life)

Item Description	Annual Charges ($1,000)
Interest on Gross Investment ($227,727,000) (.08875000)	$20,211
Amortization on Gross Investment ($227,727,000) (.00001801)	4
Operation and Maintenance	507
Major Replacements	127
TOTAL PROJECT ANNUAL CHARGE	$20,849

18. Benefits. The benefits attributable to the "Modified Plan" would accrue to four project purposes: flood control, recreation, hydropower, and water supply.

Flood control included in the project plan would result in inundation reduction benefits estimated to be $628,000 annually. This is a reduction of about 45% in the estimated total average annual flood damage downstream from the proposed dam site. Total average annual

damages were estimated to be approximately $1,401,000 to all categories of property. Estimates of the without-plan condition flood damages were developed using flood profiles of the 2, 5, 10, 25, 50, 100-year, and Standard Project Flood (SPF). These flood profiles were computed for the Conasauga and Oostanaula Rivers along a river reach extending from the proposed dam site downstream to Rome, Georgia. The estimated flood damages are based on 1981 price levels and development. The agricultural flood damages included are based on current normalized prices published in January 1980. Residential and Commercial flood damages were based on a field survey of first floor elevations and appraisal of value conducted in July 1981.

Recreation benefits were based on a reassessment of need and the "unit day value" method of benefit computation. Although the new Georgia SCORP indicates no existing net demand for some of the originally planned outdoor recreation facilities, as a conservative estimate of project economic feasibility, computation of annual visitation did assume demand equal to facility capacity. At an interest rate of 8-7/8%, 100-year project life, a 2.3 conversion, and a day unit value of $3.08, annual recreation benefits were estimated to be $507,000.

Hydropower benefits were based on generation with three standard "tube" units of 5 megawatts each, for a total capacity of 15,000 KW. Annual energy generation was computed assuming a constant 42-foot head and flows between exceedance increments of 0 to 34. Total annual energy production was estimated as 20,000,000 KWH. Applying a capacity value of $13.84 per KW and an energy value of $119.30 per MWH (FERC 1987 price level for a Plant Factor 16.6) yields total hydropower benefits of $2,593,600 annually ($207,600 capacity benefit and $2,386,000 energy benefit). The capacity and energy values used in the computation of benefits were based on a Combustion Turbine as the least-cost alternative to hydropower. A 10% private interest rate was used for capacity, and a 10% fuel cost esculation was used for the energy value (both very conservative assumptions favoring project feasibility).

According to Federal water resource planning guidelines for NED benefit evaluation procedures, the economic benefit to water supply from a multipurpose lake project is the cost of the equivalent level of supply from the least-cost, most-likely, non-Federal alternative. As part of this study, leading up to the submittal of the draft Phase I GDM dated May 1982, analyses were made which identified a plan involving pumping water from the Coosawattee River as this non-Federal alternative. These analyses are discussed in detail in the previously referenced report by Mr. Herbert Rogers, titled "Municipal and Industrial Water Use, Dalton Lake, Georgia, September 1981." The report examined water needs in the study area, and also included analyses of a number of alternatives to meet water demands out to the year 2030. The non-Federal alternative identified, which would be implemented in the absence of a Federal project, consisted of: a sill across the river to maintain a minimum depth of water at the intake structure; a raw water pumping station capable of delivering 51 million gallons per day to the Murray and Whitfield County area; and a 36-inch diameter force main, which would extend north from the Montgomery Bridge crossing on the Coosawattee River to the Dalton water treatment plant, just east of the Conasauga

River near U.S. Highway 76. The force main would extend a distance of about 22 miles from a riverbed elevation of approximately 630 feet NGVD up to elevation 715 at the Dalton water treatment plant. An estimate of first costs (construction costs) using October 1981, price levels indicated a total project cost of $8,711,000. Operation and maintenance costs for the plan were estimated to be $173,000 annually. Using a 100-year project life, and a 8-7/8% interest rate, results in an estimated total annual cost of $946,258 (also the economic benefit of water supply storage in the "Modified Dalton Lake Plan" to provide 51 MGD to the Dalton-Chatsworth area). Further more detailed study of the least-cost, most-likely, non-Federal single purpose water supply alternative was made following the completion of the draft Phase I GDM, and will be discussed in subsequent sections of this report. These further evaluations concluded that the non-Federal alternative would be supply from the existing Carters Lake Project.

A summary of National Economic Development (NED) benefits for the "Modified Dalton Lake Plan" is presented in Table 8. As shown in Table 8, the total annual economic benefit for the plan is estimated to be $4,675,000.

TABLE 8

SUMMARY OF ANNUAL ECONOMIC BENEFITS
MODIFIED DALTON LAKE PLAN

Benefit Category	Annual Economic Benefit ($1,000)
Flood Control	628
Recreation	507
Hydropower	2,594
M&I Water Supply	7,461
TOTAL ANNUAL BENEFITS	11,190

19. Economic Feasibility. Based on the conservative estimate of "Modified Plan" annual National Economic Development benefits of $11,190,000 and an estimated total project annual cost of $20,849,000, the benefit-to-cost ratio for this multipurpose plan would be 0.54.

$$\frac{\$11,190,000}{\$20,849,000} = 0.54$$

This indicates that the plan is not economically feasible at this time (benefits must be in excess of costs, i.e., B/C = 1.0 or greater). In order to attain economic feasibility benefits would have to increase by a factor of more than 1.86 times. It is also pertinent to mention that the total project cost used in the above computation is low, as no estimates were made for the costs to mitigate fish and wildlife habitat losses or for cultural resource preservation. These are significant costs, and when included would drive the need for increased benefits above a factor of 2.0 times the estimated $11,190,000 level.

MITCHELL BRIDGE SITE RECONSIDERED

20. General. Given the apparent economic infeasibility of alternative projects at the original Dalton Lake site, the seven site alternatives initially identified were reexamined. Comparisons of storage capabilities and their relationships to structure sizes and project costs were reexamined. The most promising alternative, other than the original site, was the Mitchell Bridge site. Due to differences in topography, and the available area-capacity relationship, the possibility of greatly reduced cost of lands and damages warranted analysis. The site is about 14.4 miles upstream from the original site (near Holly Creek), and is about 1/4 mile downstream from the Mitchell Bridge crossing of the Conasauga River and near the confluence of Mill Creek. The site is shown in Figure 5.

Topographic mapping of the new site and reservoir area was performed. Along the proposed dam alignment 10 borings were taken to investigate foundation conditions. Based on these data and new hydrologic information, a new design was completed. New flood control, hydropower, and recreation studies were made; also water supply benefits were reevaluated (this analysis is discussed in detail later in this report), and new estimates of cost were prepared for lands, structures, and relocations.

21. Comparison of Physical Features. Shown in Table 9 is a comparison of the physical features of the project evaluated at the original site (Modified Dalton Lake Plan), and those evaluated for the Mitchell Bridge site.

TABLE 9
COMPARISON OF PHYSICAL FEATURES
(Original Site vs. Mitchell Bridge Site)

Feature Description	Modified Plan Original Site	Mitchell Bridge
Conasauga River Mile	24.8	39.2
Drainage area controlled (sq.mi.)	624	300
Storage volume (acre-feet)		
Inactive (dead storage)	24,400	6,500
Active (conservation storage)	85,600	31,700
Floodwater	131,000	41,800
Dam		
Total length (ft)	2,394	3,000
Maximum height (ft)	75	55
Spillway length (ft)	592	161
Spillway gates (Qty)	12	3
Spillway gates (size, ft)	42x24	43x36
Reservoir area (acres)	23,712	9,500
Hydropower		
Capacity (MW)	15	5
Annual Energy (MWH)	20,000	6,800
Water Supply (mgd)	51	51

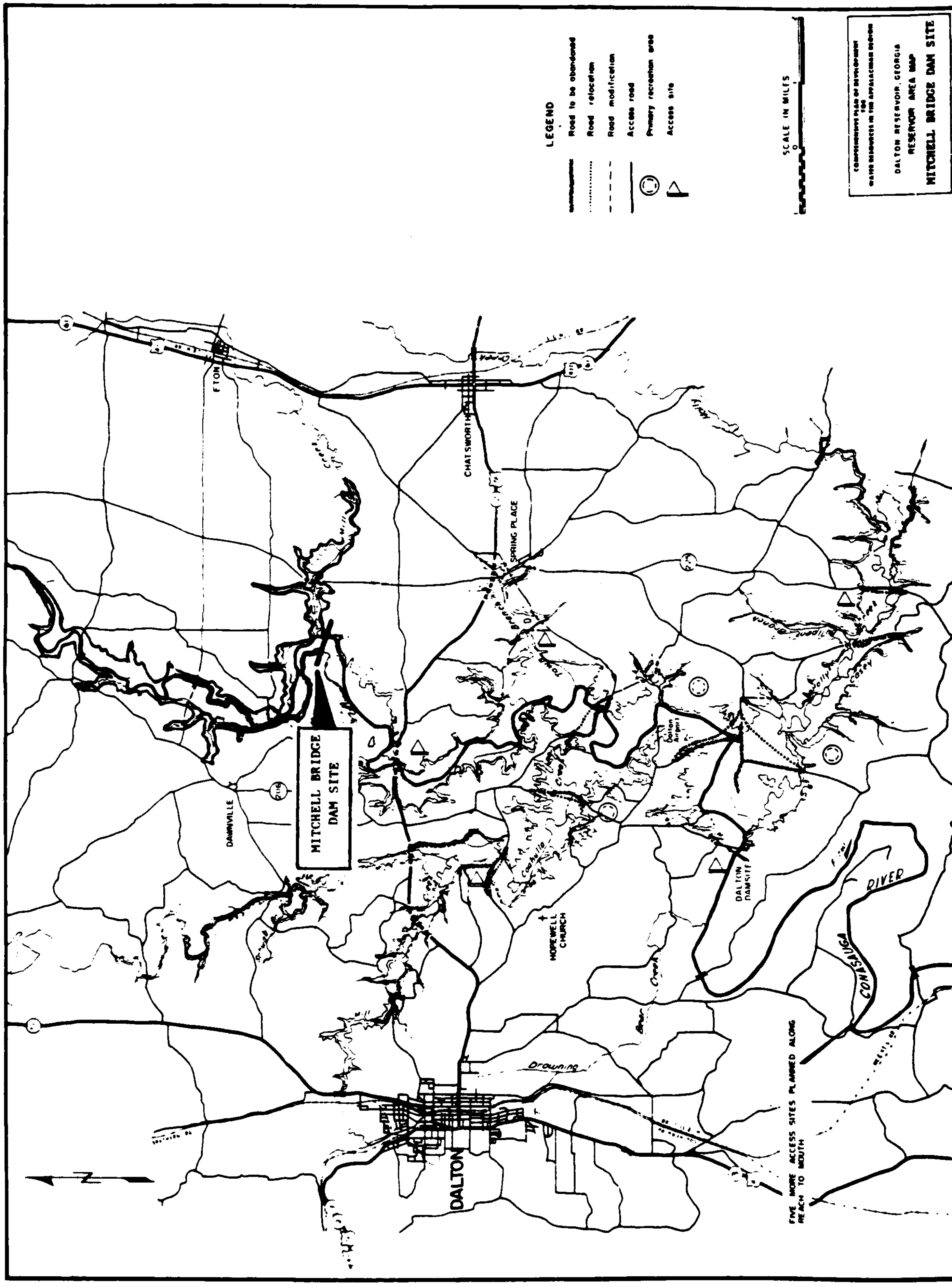

LEGEND
Road to be abandoned
Road relocation
Road modification
Access road
Primary recreation area
Access site
SCALE IN MILES
0
1
DALTON RESERVOIR, GEORGIA
RESERVOIR AREA MAP
MITCHELL BRIDGE DAM SITE
MITCHELL BRIDGE
DAM SITE
CHATSWORTH
SPRING PLACE
ETON
DAWNVILLE
DALTON
HOPEWELL CHURCH
DALTON DAMSITE
Dalton Airport
CONASAUGA
RIVER
Drowning
Bear Creek
FIVE MORE ACCESS SITES PLANNED ALONG REACH TO MOUTH

FIGURE 5

22. Design. The considered dam would have an axis that would cross the Conasauga River about 700 feet downstream of the confluence of Mill Creek. At this point the stream is about 100 feet wide, with top banks at about elevation 770 feet N.G.V.D. The floodplain elevation varies from about 770 feet to 685 feet at the site. The general layout of structures and structure details for the dam at this site are shown on Plates Nos. 1 through 5.

The dam and saddle dikes would be constructed of earth embankments having a total length of approximately 3000 feet. The upstream face of the dam would be on a 1V to 3.5H slope and the downstream face at 1V to 3.5H. The upstream face would be protected from wave action by a two foot thick layer of riprap. The riprap would extend from the top of the dam (elev. 720) down to elevation 691 (5 ft. below the conservation pool).

A service spillway would be located in the earth embankment between the right abutment and the existing channel, about 400 ft. from the existing right bank. The spillway would consist of three 43 foot wide bays separated by 8 foot piers. Flow would be controlled through the bays by three 43 foot by 36 foot tainter gates. The approach channel to the spillway would have a bottom elevation of 660 feet and side slopes of 1V to 3H. The approach channel and the earth abutments would be protected by a 3 foot thick layer of riprap in the vicinity of the spillway, and extend approximately 150 feet upstream. The spillway would be joined on the left by a concrete section and on the right by a powerhouse. The upstream face of the spillway is designed on a 1V to 1F slope, and the crest would be a standard ogee shape. The spillway was designed to provide regulation for watersupply and flood control. In so doing it would be necessary to pass 200 cfs at a pool of 680.5 feet, and pass the PMF discharge of 97,000 cfs at a pool of 715 feet. The spillway was sized to meet both conditions.

The powerhouse would be located to the right of the spillway (west side). The headrace for the powerhouse would be formed by gradually increasing the width of the spillway approach channel as it nears the dam, such that the channel bottom width is the combined width of the spillway and powerhouse. The tail race empties into the stilling basin outlet channel. The powerhouse itself would consist of two block monoliths. The right monolith would contain a 4.0 MW unit, and the left monolith would contain a 1.0 MW unit. The total dimensions of the powerhouse monolith are 101 feet wide and 97 feet long. The foundation elevation for both hydropower units would be set at 640.0 feet NGVD. Each powerhouse block would contain a semispiral intake port, the turbine and generator housing, and the draft tube exit ports. The turbines used for cost estimating purposes were two vertical Kaplans with vertical shaft synchronous generators. The cost included adjustable turbine blades, wicket gates, governor, excitation equipment, and installation. The accessory electrical equipment included a 125 volt station battery system, a battery charger, station service transformer, cable, bus, conduit, grounding, main control board, lighting system, station switchgear, and installation. Miscellaneous power plant equipment included ventilation, fire protection, communications, generator bearing cooling water equipment, and

installation. The switchyard electrical equipment included the main step-up transformer, oil circuit breaker, lightning arrestors, airbreak switches, bus work, and installation.

An alternative evaluation of five plant configurations were initially considered in the selection of hydropower units. These varied from a 1 MW plant to a 6.3 MW plant. Five units with capacities from 650 KW to 4 MW were analyzed for the turbine/generator combinations. Preliminary evaluation of construction cost, engineering feasibility, and FERC power values, indicated that a 5 MW plant, consisting of a 1 MW unit and a 4 MW unit would be the most effective combination. With this combination of units, turbine flow capacity would be: a minimum of 150 cfs, maximum of 2200 cfs, and a gap of between 550 to 600 cfs. This plant allows an "effective" dependable capacity of 940 KW, and an average annual energy of 6800 MWH at a plant factor of 15.5 percent. The 1 MW unit would allow power generation during low flow situations, and then combined with the 4 MW unit would provide generation during most high flow situations.

The <u>stilling basin</u> would be 142 feet long with baffle piers (blocks) and an end sill. The apron elevation would be constructed at elevation 654 NGVD. The outlet channel bottom would be at elevation 660 feet. The total outfall channel width would be 265 feet at the downstream end of the stilling basin with about 100 feet of that width serving as the tailrace for the powerhouse. The outlet channel would narrow about 400 feet downstream to a bottom width of 190 feet. The side slope of the channel would be 1V to 3 H.

The <u>stilling basin</u> was sized to meet the constraints of discharge and tailwater. The tailwater rating used in the design was obtained by constructing flow profiles derived from rating curves with extensions at U.S. Highway 76, State Highway 52, and State Highway 286. The discharge varied from 200 cfs for water supply to 97,000 cfs for the PMF. The tailwater would vary from elevation 665 feet to 692 feet. The SPF discharge would be 68,000 cfs, which results in a tailwater of 689.8 feet. The apron elevation would be at elevation 654 to provide 100 per cent (d2) above the apron for the SPF, this would provide about 90 percent (d2) for the PMF. The basin length is (4d2) for the SPF. The average velocity at the stilling basin end sill, for the stilling basin configuration used, would be a maximum of 19 fps for the PMF. The riprap protection in the outlet channel was sized to protect the channel from this velocity at the downstream end of the basin, and for lower velocities and less turbulent flows progressively downstream.

The <u>reservoir</u> would have a conservation pool elevation of 696.0 feet NGVD (pool area of 2,950 acres). The bottom of conservation storage was set at elevation 680.0 feet NGVD. This yields a dead storage below 680.0 feet of 6,500 acre-feet, and conservation storage between elevations 680 and 696 feet of 31,700 acre-feet. A total of 41,800 acre-feet would be available for primary flood control (2.61 inches of runoff) between elevations 696.0 and 705.0. An additional induced surcharge storage for flood operations, to mitigate the peaking effect of the pool, would be available between elevations 705.0 and 708.0 feet NGVD. Between elevations 696 and 705 releases from the dam would be

restricted so as not to exceed 4,000 cfs (80% bankfull) at Tilton gage, when combined with the local flow. If the local flow equaled or exceeded 4,000 cfs, and the pool was below elevation 705, no release would be made from the dam. When the pool reached elevation 705 the induced surcharge schedule would be followed up to elevation 708. At elevation 708 the gates would be opened to pass inflow up to the full spillway capacity. Above elevation 708 the discharge would be uncontrolled. The elevation of the PMF pool was estimated to be 715 feet NGVD (pool area of 8,700 acres).

Realestate requirements were based on a taking line at elevation 720 feet NGVD and necessary lands for dam construction. This resulted in a cost estimate based on the need for 9,500 acres to be acquired in fee simple.

23. Costs. The total first cost of construction was estimated based on October 1986 price levels, and is shown for major project features in Table 10. The total project first cost for the Dalton Lake modified plan was estimated to be $117,524,000. No estimate of the cost of fish and wildlife mitigation measures, or the cost of any cultural resource preservation plans, were made. These aspects of the plan are discussed later in this report.

TABLE 10
SUMMARY OF PROJECT FIRST COSTS
MITCHELL BRIDGE SITE, MULTI-PURPOSE PLAN
(October 1986 price levels)

Cost Account No.	Project Feature	Estimated Cost 1/ ($1,000)
01	Lands and Damages	$ 38,586
02	Relocations	4,899
03	Reservoir	3,213
04	Dam and Appurtenances	35,916
06	Wildlife Mitigation	(Not Determined)
07	Hydropower	12,273
08	Roads, Railrods, and Bridges	633
14	Recreation Facilities	3,981
18	Cultural Resource Preservation	(Not Determined)
19	Buildings, Grounds, and Utilities	1,288
20	Permanent Operating Equipment	525
	Subtotal	$101,314
30	Engineering and Design (10%)	10,131
31	Supervision and Administration (6%)	6,079
50	Construction Facilities 2/	N/A
	Total estimated Project First Cost	$117,524

1/ Costs shown for items 01, 03, 04, 06, 07, 08, 14, 18, 19 and 20 include allowances for 25% contingencies.

2/ Included in contractors field overhead as % of construction costs.

The total project investment costs, which include project first costs plus IDC, are shown in Table 11. The ID was computed assuming a five-year construction period, with mid-year equal annual expenditures ($23,504,800 each), and using a 8 7/8 percent interest rate. Total project investment cost is estimated to be $146,414,000.

Annual charges for the Mitchell Bridge site multi-purpose plan were computed based on an 8-7/8 percent interest rate, and a 100-year project life. Operation and maintenance costs were derived from similar project costs for the region. Shown in Table 12 are the annual charges for the plan; they are estimated at $13,587,000.

TABLE 11
SUMMARY OF INVESTMENT COST
MITCHELL BRIDGE SITE, MULTI-PURPOSE PLAN
(5-year construction, 8-7/8% percent interest)

Item Description	Costs ($1,000)
Total Project First Cost (from Table 9)	$117,524
Interest During Construction 1/	28,890
TOTAL PROJECT INVESTMENT COST	$146,414

1/ IDC was computed assuming a five-year construction period, with mid-year equal annual expenditures ($23,504,800 each), and using a 8-7/8 percent interest rate.

TABLE 12
SUMMARY OF ANNUAL CHARGES
MITCHELL BRIDGE SITE, MULTI-PURPOSE PLAN
(8-7/8% interest, 100-year project life)

Item Description	Annual Charges ($1,000)
Interest on Gross Investment ($146,414)(.08875000)	$12,994
Amortization on Gross Investment ($146,414)(.00001801)	3
Operation and Maintenance	550
Major Replacements	40
TOTAL PROJECT ANNUAL CHARGE	$13,587

24. Benefits. National Economic Development (NED) benefits were computed for the multi-purpose plan at the Mitchell bridge site for four benefit categories: flood control, hydropower, recreation, and water supply. Shown in Table 13 are the annual benefits attributable to the multi-purpose plan.

TABLE 13
SUMMARY OF ANNUAL ECONOMIC BENEFITS
MITCHELL BRIDGE SITE, MULTI-PURPOSE PLAN

Benefit Category	Annual NED Benefit ($1,000)
Hydropower 1/	$ 870
Flood Control	516
Recreation	173
M&I Water Supply 2/	7,461
TOTAL ANNUAL BENEFITS	$9,020

1/ Based on 6788 MW of average annual energy, 5 MW capacity, 10% energy escalation factor, 10% private sector interest rate, and a Combustion Turbine Alternative (1987 FERC furnished power values for a Plant Factor of 15.5: $12.93/KW capacity, $118.60/MWH energy).

2/ Based on least-cost most-likely alternative discussed in latter section of report, supply from Carters Lake Project.

25. Economic Feasibility. Based on conservative estimates (favoring project feasibility) of annual national economic development benefits totaling $9,020,000, and an estimated total project annual economic cost of $13,587,000, the benefit-to-cost ratio for this multipurpose plan would be:

$$\frac{\$\,9,020,000}{\$13,587,000} = 0.66$$

This indicates that the multi-purpose plan is not economically feasible at this time (costs are $4,567,000 greater than benefits). Recognizing that some costs (wildlife mitigation, and cultural resource preservation) were not included in the estimate used in this b/c ratio computation, and the fact that a generous estimate of benefits was made, there appears to be little doubt that many new favorable economic developments would have to take place before such a plan would yield a benefit-cost ratio greater than unity. Total benefits would likely have to more than double for the plan to approach economic feasibility.

Recognizing that the multi-purpose dam site was recently designated critical habitat for several darters now on the Endangered Species List, it is obvious that project environmental feasibility is a major problem. The associated NED costs that may result from addressing environmental impacts in such critical circumstances would significantly drive down economic feasibility further below unity.

NON-FEDERAL SINGLE PURPOSE WATER SUPPLY

26. General. Recognizing that water supply is the primary and most pressing need in the study area, and given the likelihood that multi-purpose plans may not be economically justified, careful consideration

was given to non-Federal single purpose water supply alternatives. As was stated previously in this report, according to Federal water resources planning guidelines for NED benefit evaluation procedures, the economic benefit to water supply storage in a multi-purpose lake project is the cost of the equivalent level of supply from the least-cost, most-likely, non-Federal alternative source. In determining the economic benefit of water supply in the project plan for the Mitchell Bridge site (51 MGD), four single purpose alternatives were analyzed in detail: a single purpose reservoir on the Conasauga River, supply from the Coosawattee River, a single purpose reservior on Holly Creek (a tributary to the Conasauga), and reallocation of storage in the existing Carters Lake Project.

27. Single Purpose Reservoir. The design and cost of a single purpose water supply project was examined for the Mitchell Bridge site on the Canasauga River. Much of the same data utilized to investigate the multipurpose project was also used for the analysis of this alternative. The required conservation storage was determined by operating the HEC-5 model with mean daily flows for the two most critical droughts and using critical evaporation rates. The bottom of the conservation pool was dictated by site topography and projected 100-year sediment deposition. Shown in Table 14 are some pertinent data on the single purpose plan. The design of the dam consisted of an earth embankment having a total length of approximately 3,000 feet (main dam and saddle dikes). Both the upstream and downstream faces

TABLE 14
SINGLE PURPOSE WATER SUPPLY RESERVOIR
CONASAUGA RIVER, PERTINENT DATA

ITEM	
Conasauga River Mile	39.2
Drainage area controlled (sq. mi.)	
Top of conservation pool, (feet (NGVD)	702.0
Maximum drawdown, critical drought (feet NGVD)	686.9
Adopted bottom of conservation pool (feet NGVD)	680.0
Conservation storage (acre-feet)	34,360.0
Dead storage below elevation 680 ft (acre-feet)	1,140.0
Dam	
Total Length (ft)	3,000
Maximum height (ft) (top at elevation 720)	55
Spillway length (ft) (fixed crest-elev 702)	600
Reservoir area (acres)	9,500
Water Supply (MGD)	51

of the dam would be on a IV to 3.5H slope. The upstream face would be protected from wave action by a 2-foot thick layer of riprap. The riprap would extend from elevation 720 (top of dam) to elevation 680 (bottom of conservation pool). A 600-foot long fixed crest spillway would be located in the earth embankment, approximately 400 feet to the right of the existing channel. The spillway would be joined on both ends by a concrete nonoverflow wall. The spillway would be an ogee

crest, set at elevation 702 feet NGVD, with a bucket type energy dissipator. A 5'-6" high by 5'-0" wide gated low flow sluice would be located 25 feet to the right of the spillway centerline. The spillway was designed to provide adequate storage for water supply requirements (the crest elevation was set by the water supply storage requirement). When the pool is below 702 feet NGVD the low flow sluice would provide the necessary water supply flows (51 MGD - 79 CFS). The width of the overflow spillway crest was sized to pass the PMF discharge of 111,120 cfs with a maximum pool elevation of 715 feet NGVD.

The total first cost of construction was estimated based on October 1986 price levels, and is shown for major project features in Table 15. The total project first cost for the single-purpose water supply alternative on the Conasauga River at the Mitchell Bridge site was estimated to be $95,617,000. No estimate was made of the costs associated with fish and wildlife mitigation measures, or cultural resource preservation plans.

The total project investment cost (first costs plus IDC) were computed to be $119,122,000. The IDC was computed based on a five-year construction period, with mid-year equal annual expenditures ($19,123,400), and using an 8-7/8 percent interest rate.

TABLE 15
SUMMARY OF PROJECT FIRST COSTS
MITCHELL BRIDGE SITE, SINGLE-PURPOSE PLAN
(October 1986 price levels)

Cost Account No.	Project Features	Estimated Cost 1/ ($1,000)
01	Lands and Damages	$ 38,586
02	Relocations	4,899
03	Reservoir	3,213
04	Dam and Appurtenances	29,626
06	Wildlife Mitigation	(Not Determined)
07	Hydropower	0
08	Roads, Railroads, and Bridges	633
14	Recreation Facilities	0
18	Cultural Resource Preservation	(Not Determined)
19	Buildings, Grounds, and Utilities	910
20	Permanent Operating Equipment	367
	Subtotal	82,428
30	Engineering and Design (10%)	8,243
31	Supervision and Administration (6%)	4,946
50	Construction Facilities 2/	N/A
	Total Estimated Project First Cost	$ 95,617

1/ Costs shown for items 01, 02, 04, 06, 07, 08, 14, 18, 19, and 20 include allowances for 25%.

2/ Included in contractors field overhead as % of construction costs.

Annual charges (surrogate water supply benefit for multi-purpose plan) were computed based on an 8-7/8 percent interest rate, and a 100-year project life. Operation and maintenance costs, and major replacements were estimated based on similar projects in the region. Annual charges for the plan are shown in Table 16, and are estimated to be $10,944,000.

TABLE 16
SUMMARY OF ANNUAL CHARGES
MITCHELL BRIDGE SITE, SINGLE-PURPOSE PLAN
(8-7/8% interest, 100-year project life)

Item Description	Annual Charges ($1,000)
Interest on Gross Investment ($119,122,000)(.08875000)	$10,572
Amortization on Gross Investment ($119,122,000) (.00001801)	2
Operation and Maintenance	350
Major Replacements	20
TOTAL PROJECT ANNUAL CHARGE	$10,944

28. Coosawattee River Supply. Because of the immediate and increasing need for municipal and industrial water supplies for the Dalton and Chatsworth area, an examination of water supply and use in the Upper Coosa River Basin was performed. The results of that examination are presented in a report prepared for the Corps of Engineers Mobile District by the U.S. Army Corps of Engineers Hydrologic Engineering Center. The report is titled, "Water Supply and Use, Dalton Lake, Georgia". It contains a hydrologic analysis of water supply and use with an emphasis on flow availability in the Coosawattee River downstream of Carters Dam. Streamflow records at 21 gage locations were analyzed to assess the availability of surface water. Withdrawal and discharge records at 364 locations throughout the basin were analyzed to determine water use. To show the relationship between supply and use, the basin was divided into ten hydrologic sub-units and data presented in a water balance. A detailed analysis was made of the impact of withdrawing 51 MGD from the Coosawattee River downstream of Carters Lake and the role of the reservoir on downstream releases. All analyses were performed using microcomputer hardware and software. This makes available, on diskettes, the supply and use data for future analyses. This data, and training in the use of the software developed as part of the study, has been made available to the State of Georgia.

Surface water supply was examined in several different ways, during this investigation: low-flow frequency analyses, duration-probability analyses, flow-duration analyses; drought duration, magnitude and severity; stochastic analysis, daily flows of record. Each analysis presented, in a different way, information on the availability of surface water supply. The 7Q10 streamflow was used as a reference flow because of its regulatory role in maintaining instream water quality. The 7Q10 is an average flow for seven consecutive days which has a probability of 0.10 of not being exceeded during any one year. It was found that the Coosa Basin streams are both a plentiful supply, and susceptible to drought. Wet seasons and years provide a good supply

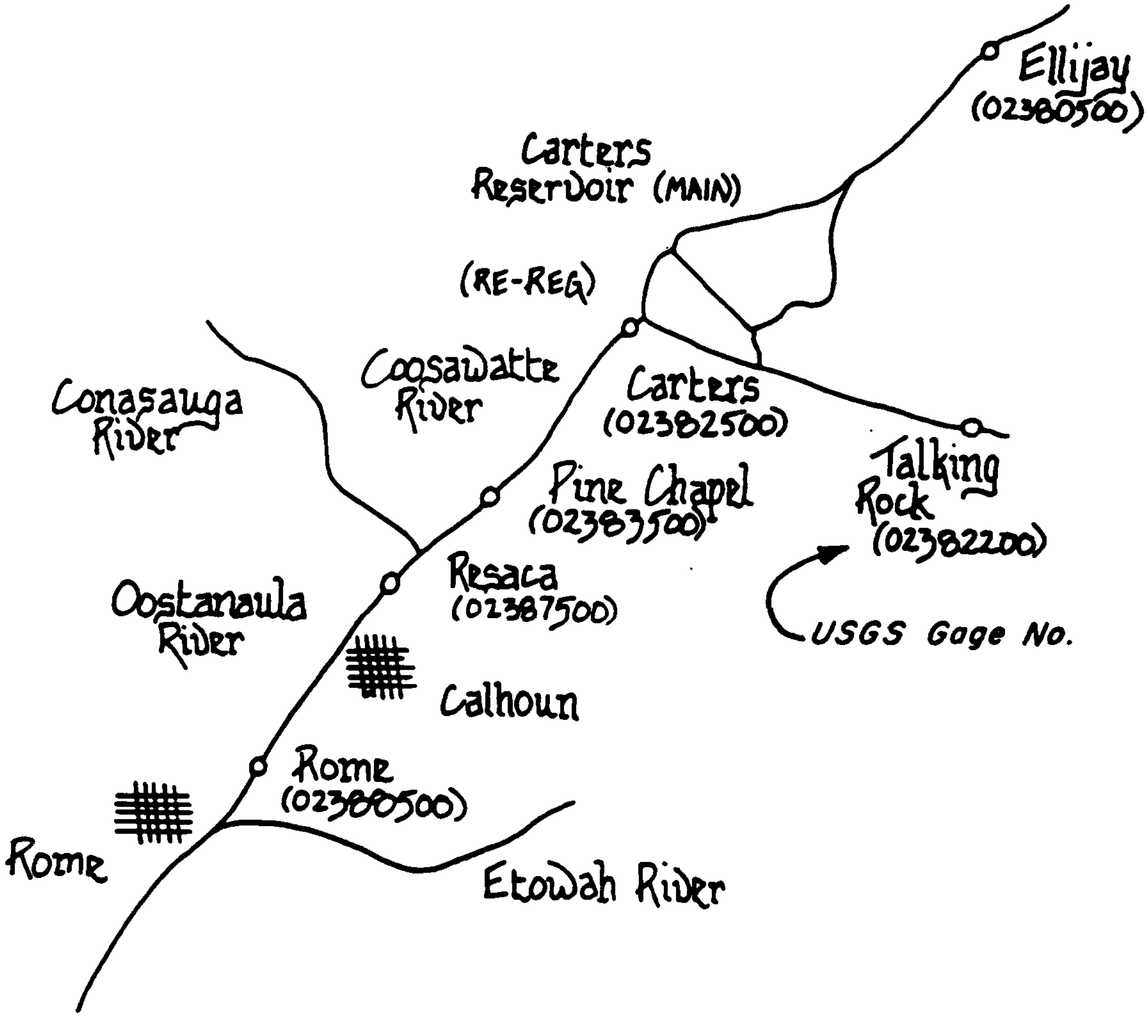
source, however, storage is not available to store this supply, so the region is vulnerable to dry periods. An analysis of the principal droughts of record showed mean annual flows, below the period of record mean annual flow, for up to nine consecutive years at some stations.

The low-flow period in the Coosa Basin are the months of June through November. The June through November flow at several representative stations have below annual mean streamflow for the period of record, as expected. Low-flow frequency analyses indicate the probability of different magnitudes not being exceeded for different durations. At some gaging stations there is little difference in the magnitude of flow for seven consecutive dry days or thirty consecutive dry days. At other stations the difference is significant. Lower flows for longer durations mean more difficulty in meeting demand or more storage to supplement available supply.

Withdrawal and discharge data were analyzed for the past five years, 1980-1984. This analysis shows that over 90 percent of the withdrawals in the basin are by six users (excluding Hammond Power Plant). Similarly, 80 percent of the discharge in the basin is by ten users. Consumptive use varies from zero to 86 percent depending upon the user. Withdrawal and discharge data vary from month to month and year to year. The monthly variation for 1984 is relatively small. The variation from year to year shows no consistent trend for most users. Some years are higher, others lower.

A comparison, by hydrologic sub-unit, of 1984 consumptive use shows that it is less than 6 percent of the minimum mean annual streamflow and less than 25 percent of the minimum mean September flow. The minimum annual and minimum September streamflows are the minimum of record. These minimum streamflows were also compared with the 7Q10 plus cumulative withdrawals for each hydrologic sub-unit. This showed that on an annual basis that 7Q10 plus withdrawals were less than 50 percent of the minimum annual flow for all sub-units except one where it was 66.6 percent. Examining September data the analysis showed that in seven sub-units the 7Q10 plus withdrawals exceeded the minimum September flow of record. Under this worse case situation withdrawals upstream may have to be reduced to provide for instream flow requirements.

Withdrawal of water from the Coosawattee River below Carters Lake or withdrawal directly from Carters Lake are considered two likely alternative supply sources to the Dalton Lake multi-purpose project. Analyses were performed which examined the operation of Carters Reservoir; the historical streamflow records downstream; stochastic analyses of streamflow at Carters; and the impact downstream of withdrawing water from the Coosawattee River near Carters. Figure 6 shows the stream gages and downstream locations involved in the analyses.



STREAM GAGE LOCATION MAP

FIGURE 6

Since its completion in November 1974, Carters Dam has regulated inflow from the Coosawattee River below Ellijay, Talking Rock Creek and local drainage around the reservoir. Flood control and hydroelectric power are the authorized purposes of the Reservoir. The generation schedule is established on a weekly basis by the Georgia Power Company and releases are made by the Corps of Engineers in accordance with arrangements with the Southeastern Power Administration (SEPA).

Filling of the reservoir occurred from closure in November 1974 until top of power pool was reached in July 1975. During the first 6 years of the project's operation the hydropower schedule and pumpback use of the re-regulation reservoir had a major effect on the re-regulation discharge regime. Flows from day-to-day could vary from the channel capacity of 4500 cfs to the minimum required release of 240 cfs. This variability occurred during both the wet and dry periods of the year. In general through, the project discharged inflows over a one to two week period. However, in response to bank sloughing and environmental objections to this mode of operating, the operation of the re-regulation dam was changed. The project still discharges inflow over a one to two week period (unless flow is controlled by the minimum 240 discharge); but discharges are steady over 7 days when discharging less than 600 cfs, and vary only slightly when discharges are higher. In general, hydropower release patterns are completely re-regulated by the re-regulation dam.

Operation records show a wide variation in reservoir storage during the low-flow period June through November. Over the period of record (August 1975 through September 1984) the difference between minimum and maximum end-of-month storage in the main reservoir was 42,000 ac-ft. In the re-regulation reservoir the difference was 16,000 ac-ft (August 1975 through September 1983). Because releases are made based upon power demand it is difficult to establish criteria for reservoir simulation. Although conventional generation of Carters Dam (and drawdown of Carters and augmentation of flow downstream of the re-regulation dam) is possible, under present hydropower marketing arrangements, the power customer has elected to defer receiving such power because to accept it would adversely impact the pumpback efficiency and generating capacity of the project. Thus, in water-short periods when hydropower generation is determining the release at most other projects, the Carters release has been controlled by the minimum (240 cfs) release requirement.

An examination of the 36 years of daily streamflow at Carters (USGS records), with 240 cfs used as a minimum, shows there were approximately 183 days when the daily streamflow fell below 240 cfs. A withdrawal of 79 cfs (51 MGD) from the Coosawattee at Carters would not be permitted if it reduced the flow below 240 cfs. That is to say, 319 cfs is needed in the Coosawattee River at Carters to prevent a shortage in the withdrawal. An analysis of the historical record shows there have been approximately 723 days where the streamflow fell below 319 cfs.

The historical record analyzed includes both unregulated and regulated streamflow. The unregulated period extends from 1897 to 1971. The regulated period from 1976 to 1984. Year 1975 is not included in the

regulated period because the reservoir was being filled. For statistical analyses such as flow-duration and low-flow frequency it is appropriate to split the record into the unregulated and regulated periods. These analyses are discussed below. For purposes of comparison the entire historical record was also analyzed.

Flow-duration analysis uses all daily records - both wet and dry seasons. As a consequence flow-duration curves provide statistical information concerning the total streamflow available. Flow duration curves for the unregulated and regulated periods of the historical record were compared with each other, and with a curve for the entire period of record. There was relatively little difference in the three curves in the range of 240 cfs to 319 cfs, which is of particular interest in this study.

Another useful analysis is low-flow frequency. In this analysis a single low-flow event is selected each year and the probability (frequency) of that event occurring is calculated. This is similar to flood-frequency analysis. The event selected is defined by its duration (number of consecutive days) and average streamflow during the duration. A family of low-flow frequency curves for the gaging station 02382500 at Carters for unregulated and regulated conditions were developed. As the duration of the low-flow event increases from 7-days to 90-days the magnitude of the average flow increases.

A duration of 7-days and average flow of 240 cfs has a 0.10 probability of not being exceeded. This is the 7Q10 criteria. If 319 cfs were required at Carters, the probability, under regulated conditions, of a low-flow event of 7-day duration and average flow of 319 cfs or less is 0.70. Thus, the probability of such an event occurring in any given year is increased from 0.10 to 0.70. The probability is greatly influenced by the number of years used. If the entire historical record is used, the probability of a low-flow event of 7-day duration and average flow of 319 cfs or less is 0.38. The nine year record of regulated flows is too short for statistical analysis. A better estimate is made using the entire record.

The analyses previously discussed utilized historical records of streamflow and reservoir inflow. Based upon these records several probabilities of non-exceedance were estimated. It is not likely, however, that these exact sequences of historical flows will be repeated in the future. To complement the analysis of historical records, stochastic analysis is used. Stochastic analysis is based upon the concept that the historic records are observations of a random (stochastic) process in which the future occurrences of streamflow are governed by probability laws. If the probability laws governing the uncertainty of future streamflows can be assumed, then a probabilistic model of the streamflow can be developed. The development and application of such a model of streamflow is commonly referred to as stochastic analysis, stochastic hydrology or synthetic hydrology. The streamflows generated from such a model are referred to as stochastic or synthetic sequences or flows. The principal advantage of using stochastic sequences is that they are not identical to the historical flow sequences, but consider the randomness of future streamflows as

reflected by the probability laws adopted for the stream and used in the stochastic model.

For the Coosawattee River below Carters a stochastic model of the mean monthly streamflow was developed using computer program HEC-4, Monthly Streamflow Simulation. Historical data at three stream gage stations (Carters, Pine Chapel and Resaca) were used to develop the model. Because Carters Reservoir regulated the Coosawattee River after its completion, the inflow to the reservoir as measured by the change in storage in the main reservoir plus the inflow to the re-regulation reservoir was substituted for the observed flows for the period August 1975 to August 1985. The long record stations at Pine Chapel (02383500) and Resaca (02387500) were used to extend and fill-in the record at Carters (02382500).

Using the HEC-4 stochastic model of streamflow at Carters, a sample record of 1000 years of monthly synthetic streamflow data were generated. A statistical analysis of these data resulted in the probability estimates of streamflow at Carters that will be less than the indicated values for the indicated months. The months, October and September are the most at risk. There is a .047 probability (or 4.7 percent chance) that the mean monthly flow at Carters will not exceed 240 cfs during October. There is a .150 probability (or 15.0 percent chance) that the mean monthly flow at Carters will not exceed 300 cfs during October.

The probabilities discussed above provide an estimate of future flows dropping below certain levels. These estimates are based upon the underlying probability laws assumed for the streamflow and the stochastic model used to generate the 1000 years of monthly synthetic data. As such, they are only estimates which are useful together with historical data to attempt to quantify the risk of the unknown future.

At Resaca gage (near Calhoun) (023897500) and Rome (02388500) on the Oostanaula River, the State of Georgia 7Q10 streamflow requirements are 340 cfs and 510 cfs respectively. An examination of statistics from the entire historical record of daily flows provides an estimate of the number of days of the streamflow being lower than these values. At Resaca the daily flow-duration data indicates approximately 250 days in the 91 year historical record the daily flow fell below 340 cfs. At Rome a similar analysis shows that 510 cfs has not been exceeded approximately 131 days during the record.

If an additional 79 cfs were to be withdrawn upstream at Carters the threshold level for the 7Q10 flow would be 419 cfs and 589 cfs at Resaca and Rome respectively. The number of days these flows have not been exceeded during the historical record is 678 (Resaca) and 446 (Rome).

Using low-flow frequency analysis the probability of low-flow events of seven consecutive days being equal to or less than the average flow indicated were determined. A flow of 340 cfs at Resaca has a probability of approximately 0.12 of being equal to or less. A flow of 419 cfs has a probability of 0.24. At Rome the 7-day low-flow probabilities are 0.16 and 0.30 for 510 and 589 cfs respectively. It

should be noted that in the above analyses the probabilities for 340 cfs and 510 cfs are slightly different from the 7Q10 criterion of 0.10. This is probably due to the additional daily records at the gages which have become available since the 7Q10 flow was computed.

The foregoing analyses describe the hydrologic impact of withdrawing 51 MGD from the Coosawattee River near Carters. It is clear from these analyses that 51 MGD will not be available at all times. If withdrawals had been made during the 36 years of the historical record there would have been an estimated 723 days where the streamflow would not have been adequate. In recent times with the regulation of flow by Carters Dam, the USGS data show there have been approximately 265 days when the streamflow was less than that required for full withdrawal. Another way to assess supply is by examining the change in probability of shortage. To accommodate a withdrawal of 51 MGD the probability of the 7-day duration low-flow event would increase from 0.10 to 0.38. Stochastic analyses of monthly flows shows a similar increase in probability.

For those times when withdrawals cannot be made from the Coosawattee River, a secondary supply source must be found. The preceeding analysis shows that such times will be infrequent, therefore, the selection of a secondary source should reflect its expected infrequent use. Some alternatives are: groundwater pumping, storage, interbasin transfer, purchase from other suppliers, conservation, curtailment of operation, or combination of these. Several factors govern the selection of the secondary source. One is availability of the alternative supply. Groundwater, for example, is in limited supply in the region. A second factor is reliability. A greater capacity system will be required to insure that 51 MGD is always available than if some shortages are tolerated when the Coosawattee is low. Because withdrawal from the Coosawattee River is being examined as an alternative to Dalton Lake multipurpose plan, the reliability should be the same in both projects. A third factor is cost. The minimum cost alternative which is available, and which provides the necessary reliability, should be selected.

In order to provide a comparably reliable source of supply, to that which could be provided in the multipurpose plan, it was determined that a secondary storage site must be evaluated. Given the extremely limiting environmental constraint of critical darter habitats in this area of north Georgia, and the large volume of storage required to supplement flow from the Coosawattee River during drought periods, only one potential solution for a single purpose water supply lake was identified (it is pertinent to note, that at this time in the study process a number of darters who occupy the Conasauga River at both multi-purpose dam sites, and other streams in the study area, had been added to the list of endangered species). This potential dam site is located on Holly Creek, a tributary to the Conasauga River. Analyses of the flows available in Holly Creek at this site indicate that with a small increase in the amount of storage required to augment flow from the Coosawattee during droughts, that Holly Creek alone could meet the 51 MGD need. This meant that with a storage reservoir on Holly Creek, that no flow from the Coosawattee would be needed to meet the water supply needs of the Dalton and Chatsworth area into the year 2030.

Therefore, further efforts were directed toward the evaluation of Holly Creek as a single-purpose reservoir site.

29. Holly Creek Single-Purpose Reservoir. This Holly Creek alternative was formulated because no known darter habitats occur in the creek (probably due to the history of extremely poor water quality). Holly Creek originates in the Cohutta Mountain range about 12 miles east-northeast of the City of Chatsworth, Georgia. It flows westerly from its headwaters for about 10 miles, then turns in a southerly direction about 4 miles north of Chatsworth. Flowing southerly for about 12 miles the Creek passes thorough the western edge of the City of Chatsworth. About 8 miles downstream from Chatsworth, a major tributary, Rock Creek enters on the left bank (east side) and the channel turns to flow in a generally westerly direction. About 2 miles downstream from Rock Creek another major tributary, Buck Creek, joins Holly Creek and the topography reduces the valley width to a relatively narrow dimension (potential dam site). From this tributary, the Creek continues to flow westerly for about 3 miles where it enters the left bank (east) of the Conasauga River. Its confluence with the River is just upstream from the originally considered Dalton Dam site, and about six miles southeast of the City of Dalton.

The considered dam site on Holly Creek is located about 1.7 stream miles west of the Georgia State Highway 225 bridge crossing, and about 0.1 mile downstream from the confluence of Buck Creek. The dam site is shown on Figure 7. The design of the dam would be similar to that described for the single-purpose project on the Conasauga River at the Mitchell Bridge site. The dam would consist of an earth embankment having a total length of approximately 2400 feet, an emergency fixed crest spillway of 450-foot width in a saddle on the right abutment, and a 3-foot inside diameter low flow gated sluice located along the alignment of the existing creek channel about 1000 feet to the left of the right abutment.

An HEC-5 reservoir simulation model was developed to simulate the operation of the considered dam during the critical drought period. The model was operated to make a constant release of 84.4 cfs, 79.0 cfs for water supply (51MGD) and 5.4 cfs for water quality (7Q10 for Holly Creek). The storage capacity of the reservoir was determined from area-capacity curves developed using 1:24,000 scale quadrangle maps with 10-foot contour intervals. Future sedimentation deposits were estimated by applying a drainage area ratio to the quantities computed for the multi-purpose project site on the Conasauga River. Stream flow data were taken from the Chatsworth streamgage, station 02385800, located approximately 5.5 miles upstream from the considered dam site. Twenty-six years of record are available from 1960 to 1986 at this gage. The critical draught period at this station occurred in 1960 and 1970. Drainage area ratios were used to adapt the gage data for use as inflow

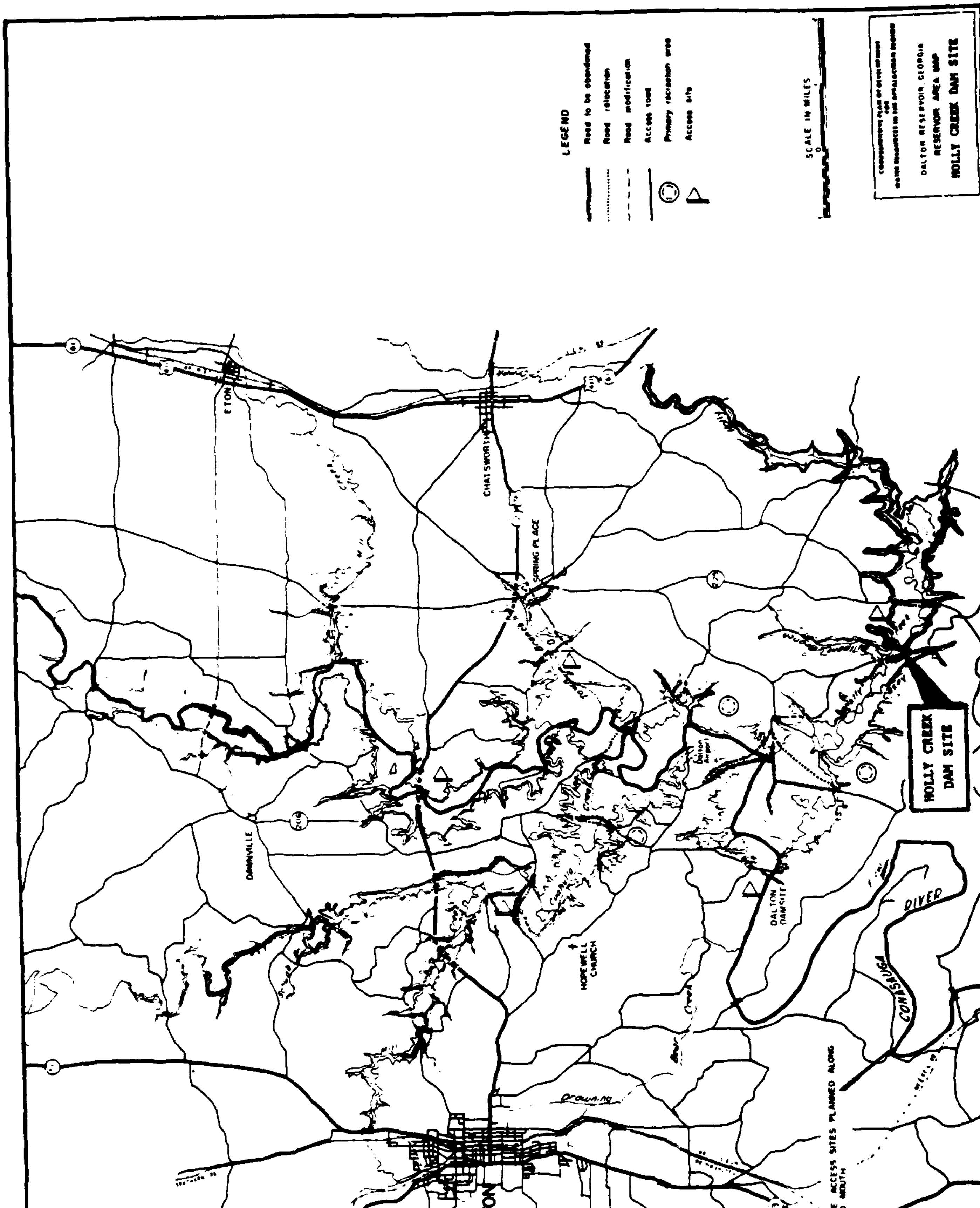

LEGEND
Road to be abandoned
Road relocation
Road modification
Access road
Primary recreation area
Access site
SCALE IN MILES
DALTON RESERVOIR, GEORGIA
RESERVOIR AREA MAP
HOLLY CREEK DAM SITE
ETON
CHATSWORTH
SPRING PLACE
DAWNVILLE
HOPEWELL CHURCH
DALTON DAMSITE
HOLLY CREEK DAM SITE
CONASAUGA RIVER
DALTON
FIVE MORE ACCESS SITES PLANNED ALONG REACH TO MOUTH

FIGURE 7

to the dam. A trial and error analysis was made using the HEC-5 model to establish the normal pool elevation and conservation storage. The model was operated using mean daily flows and critical evaporation rates.

The Probable Maximum Precipitation (PMP) for the drainage basin above the dam was determined and distributed by the methods set forth in the National Weather Service publications HMR-51 and HMR-52. This was accomplished using the HEC computer program HMR-52. Various storm centerings and orientations were optimized with the program. The Probable Maximum Flood (PMF) was computed by applying the PMP to a 3-hour HEC-1 runoff model. The Standard Project Flood (SPF) was computed by multiplying the PMF by 0.5, as permitted in Corps' EM 1110-2-1411.

To prevent possible flooding to the Louisville and Nashville Railroad, a fixed crest spillway with uncontrolled flow was sized to pass the PMF with a peak pool elevation of approximately 711.0 ft. NGVD (this allows adequate freeboard as the railroad is above elevation 720). The spillway width would be approximately 450-foot with a crest elevation of 701.0 feet NGVD. The minimum flow requirement (7Q10) and water supply releases would be provided through a low flow sluice with an invert elevation at the intake tower of 672 feet NGVD. The sluice would discharge to a concrete impact basin, then into the natural stream bed. In setting the top of dam elevation, a five foot freeboard was added to the maximum pool elevation of 711 feet. Pertinent data on the Holly Creek single-purpose water supply lake is shown in Table 17.

TABLE 17
SUMMARY OF PERTINENT DATA
HOLLY CREEK SINGLE-PURPOSE LAKE

DESCRIPTION	
Location on Holly Creek (stream mile)	8.8
Length of dam (feet)	2400
Maximum height of dam (feet)	46.0
Top of dam elevation (ft. NGVD)	716.0
Top of conservation pool (ft. NGVD)	701.0
Bottom of conservation pool (ft. NGVD)	680.0
Conservation Storage (acre-feet)	26,200
Dead storage below elevation 680 (acre-feet)	2,000
Total PMP excess (inches)	34.05
PMF inflow at dam (cfs)	56,000
PMF pool elevation (ft. NGVD)	711.0
SPF pool elevation (ft. NGVD)	707.0
Water Supply (MGD)	51
Reservoir Area at elevation 707 (acres)	3,230
Reservoir Area at elevation 711 (acres)	3,870

An estimate of first cost to construct the dam and lake on Holly Creek is shown in Table 18. The total estimated project first cost is shown

as $50,981,000, at October 1986 price levels. No estimate was made of the costs associated with fish and wildlife mitigation measures, or cultural resource preservation plans.

TABLE 18

SUMMARY OF PROJECT FIRST COSTS

HOLLY CREEK SINGLE-PURPOSE LAKE

(October 1986 price levels)

Cost Account No.	Project Feature	Estimated Cost 1/ ($1,000)
01	Lands and Damages	$ 16,247
02	Relocations	2,765
03	Reservoir	1,353
04	Dam and Appurtenances	22,628
06	Wildlife Mitigation	(Not Determined)
07	Hydropower	0
08	Roads, Railroads, and Bridges	267
14	Recreation Facilities	0
18	Cultural Resource Preservation	(not determined)
19	Buildings, Ground and Utilities	505
20	Permanent Operating Equipment	184
	Subtotal	$ 43,949
30	Engineering and Design (10%)	4,395
31	Supervision and Administration (6%)	2,637
50	Construction Facilities 2/	N/A
	Total Estimated Project First Cost	$ 50,981

1/ Costs shown for items 01, 03, 04, 06, 07, 08, 14, 18, 19, and 20 include allowances for 25% contingencies.

2/ Included in contractors field overhead as % of construction costs.

The total project investment cost (first cost plus IDC) were computed to be $63,513,183. The IDC was computed based on a five-year construction period, with mid-year equal annual expenditures ($10,196,200), and using an 8-7/8 percent interest rate.

Annual charges were computed based on an 8-7/8 percent interest rate, and a 100-year project life. Operation and maintenance costs, and major replacements, were estimated based on similar projects. Annual charges for the plan are shown in Table 19, and are estimated to total $5,953,000.

TABLE 19
SUMMARY OF ANNUAL CHARGES
HOLLY CREEK SINGLE - PURPOSE LAKE
(8-7/8% Interest, 100-year project life)

Item Description	Annual Charges ($1,000)
Interest on Gross Investment ($63,513,183)(.08875000)	$ 5,637
Amortization on Gross Investment ($63,513,183)(.00001801)	1
Operation and Maintenance	300
Major Replacements	15
Total Project Annual Charge	$ 5,953

In order to provide water from the storage which would be provided in the lake, water supply releases would be made through the low-flow sluice downstream to a sill and pumping station. From the pumping station raw water would be transported through a 48 inch diameter force main to the Dalton water treatment facility on the west bank of the Conasauga River just above Highway 76. The sill and pumping station on Holly Creek would be located at about mile 2.4, or just about 4.7 miles downstream from the Highway 225 bridge crossing of Holly Creek. The estimated first costs and cost of operation and maintenance for the pump station, force main, and power distribution to the pump station are shown in Table 20. The total system annual cost is estimated to be $1,765,600.

TABLE 20
ESTIMATED COST
HOLLY CREEK PUMP STATION
(October 1986 prices)

Capitol Costs	Costs
Force Main (48")	$ 9,920,000
Land Pump Station (4 pumps & Intake Structure)	2,740,000
Power Distribution (line, stubstation, switchgear)	282,000
Total Capitol Cost	$12,942,000
Operation & Maintenance Costs	
Force Main	$ 17,800
Pump Station (includes power)	599,000
Total Operating and Maintenance Costs	$ 616,000
Total System Annual Cost (8-7/8%, 100 YR)	$ 1,765,600

In addition to providing the dam and lake, pumping station and sill, a third project element must be provided to permit Holly Creek to function as a reliable water supply source. The Chatsworth Water Pollution Control Plant (WPCP) discharges its effluent into Holly Creek just south of the city. This discharge point would be upstream of the considered Holly Creek Dam site. Some modificaton of the treatment process would

be required to bring Holly Creek up to water quality standards appropriate with the water supply use. These costs must be included in any assessment of the economic viability of this alternative as a least-cost, most-likely, non-Federal alternative source.

In October 1983, the Georgia Department of Natural Resources Environmental Protection Division conducted an intensive survey of the water quality of Holly Creek. Water quality samples were taken at nine sampling locations, including the following three: upstream of the City of Chatsworth Water Pollution Control Plant at the City water supply intake, at the WPCF effluent discharge, and downstream of the WPCP at U.S. Highway 411. The results of this sampling and testing indicated that the Chatsworth WPCP was not in compliance with its National Pollutant Discharge Elimination System (NPDES) Permit. The effluent concentrations of BOD_5 (61 mg/l) and TSS (152 mg/l) were substantially in excess of the permit limitations ($BOD_5 \leq 30$ mg/l, and TSS ≤ 30 mg/l). The high COD (414 mg/l) and relatively low NH_3 (2.4 mg/l) are indicative of the textile industry wastewaters, which are the primary constituent of the Chatsworth WPCP influent. Also, the downstream sampling indicated extreme violations in the D.O. and fecal coliform criteria; while the temperature and PH criteria were met. The D.O. at points below Highway 411 was generally less than 3.0 mgl. Holly Creek below Highway 411 was observed, during the survey, to be highly degraded and unacceptable for fish propagation, as well as, unacceptable as a drinking water source. Holly Creek, upstream of the WPCP, met all water quality standards for both fishing and drinking water. This good water quality is generally indicative of conditions on Holly Creek, if the WPCP effluent discharge were to be eliminated.

Since the 1983 survey, the Chatsworth WPCP has made improvements in its operations and treatment facilities. Recent data reflect better effluent quality. In October 1985, effluent BOD_5 was 17 mg/l, TSS was 93 mg/l, and effluent dissovled oxygen was 2.7 mg/l. In October 1986, these same parameters were observed to be: 19 mg/l, 17 mg/l, and 3.6 mg/l, respectively. Although the BOD_5 and TSS have improved, the D.O. levels were still well below the 6.0 mg/l effluent limitation. The quality of Holly Creek, as a result of the improved WPCP, has improved somewhat, but still does not meet drinking water quality standards.

For the purpose of evaluating Holly Creek as a potential water supply source, the Georgia Department of Natural Resources Environmental Protection Division prepared an investigation of alternatives to allow Holly Creek to be utilized as a surface water supply source. Based on the information and analyses performed for that investigation, it has been determined that, the most reliable method to alleviate the potential drinking water quality problems on Holly Creek would be to treat up to 0.50 mgd of the influent to the Chatsworth WPCP, and to transport flows in excess of the 0.50 mgd level to the Dalton, Georgia, Riverbend Wastewater Treatment Facility for biological treatment. The wastewaters generated in the Chatsworth and Dalton communities are very similar in both waste constituents and concentrations. This is because

both systems are strongly affected by the discharges from the textile industry. This treatment option would also require minor modification of the existing Holly Creek Treatment Plant (WPCP), and the construction of transportation facilities from the plant site to the Riverbend Facility. Obviously, this alternative treatment would require an agreement between the City of Chatsworth and Dalton Utilities, as well as the citizens and public officials in both counties (Whitfield and Murray). The total capitol cost of such a treatment option was estimated to total $6,076,300, with operation and maintenance costs estimated to be $319,200 (October 1986 price levels). Total annual costs, using an 8-7/8 percent interest rate and a 50-year project life would be $858,600 (539,381 Interest and Amortization + 319,200 O&M).

In summary, the total annual cost of utilizing Holly Creek as a surface water supply would consist of the annual cost of all three major project elements as shown in Table 21. The total annual cost of the Holly Creek single-purpose water supply alternative was estimated to be $8,578,000 (provides 51 MGD).

TABLE 21
TOTAL ESTIMATED ANNUAL COST
HOLLY CREEK WATER SUPPLY ALTERNATIVE
(October 1986 Prices, 8-7/8% Interest)

ITEM	ANNUAL COST ($1,000)
Single-Purpose Dam and Lake	$5,953
Pump Station, Force Main, and Power Distribution	1,766
Treatment Modification (WPCP)	859
Total Annual Cost	$8,578

30. Carters Lake Storage reallocation - The Carters Lake Project is located on the Coosawattee River about 26.8 miles above its junction with the Conasauga River near the town of Carters in northwest Georgia. It is approximately 60 miles north of Atlanta, Georgia and about 50 miles southeast of Chattanooga, Tennessee. The project lies in both Murray and Gilmer County, Georgia. The primary purposes of the project, as stated previously, are flood control and the production of hydroelectric power. Other uses include fish and wildlife conservation, recreation and water quality control.

The principal features of the Carters Project consist of a 1950-foot-long rock-fill dam with a maximum height of about 445 feet, 3 saddle dikes on the left bank, a 258-foot-long high level gated spillway on the left bank, a powerhouse on the right bank containing 2 conventional and 2 reversible generating units with equal capacity for a total generating capacity of 500,000 KW, switchyard facilities and a reregulation dam about 1.8 miles downstream from the main dam. The reservoir at the top of the flood control pool, elevation 1099.0 NGVD, has a surface area of 3,880 acres and a capacity of 472,800 acre feet, of which 95,700 acre

feet is for flood control, 134,900 acre feet is for power, and 242,200 acre feet is dead conservation storage. Additional pertinent data on the project are contained in Table 22.

The reregulation dam is a rock-fill dam with a maximum height above the river bed of about 47 feet. This structure contains a gated spillway for reregulation of power waves. The reservoir extends to the main Carters Dam and provides tailwater elevations between 665 NGVD to 698 NGVD.

In producing hydroelectric power, the Carters Lake Project operates as a peaking plant. The reregulation dam stores water in excess of the required downstream flow to provide a sufficient tailwater elevation at the main dam to permit efficient pump-back operations. Pump back is accomplished during off-peak hours when excess energy is available. During low flow periods the ratio between pump back and water used for peak power production is carefully monitored to insure the maintenance of minimum outflow from the reregulation dam (240 cfs - the 7Q10).

Carters Dam stores inflow during floods with outflow limited to that which can be retained by the reregulation dam until the flood storage is depleted. During floods the reregulation dam passes the inflow from Talking Rock Creek (flows into the reregulation dam below the main dam), and stores the releases from Carters main dam until conditions downstream permit additional releases. Once the storage in the reregulation dam is depleted, only limited peaking generation at Carters is permitted.

Power releases from Carters Dam are reregulated by the lower reservoir to maintain a more uniform outflow and provide storage for pump back. This outflow is determined by the pool elevation in the reregulation reservoir, the generation schedule, the expected volume of pump back, the inflow from Talking Rock Creek, and the required minimum outflow.

The Carters project is part of an integrated system that includes the entire Coosa and Alabama River basins. Additional Federal projects in the system are: the Allatoona flood control-power project on the Etowah River, the Claiborne navigation project, and the Millers Ferry and Jones Bluff navigation-power projects on the Alabama River below Montgomery. The Alabama Power Company owns and operates seven hydroelectric developments on the Coosa River downstream from the Carters Lake project. These projects are the Weiss, H. Neely Henry, Logan Martin, Lay, Mitchell, Jordan, and Walter Bouldin dams. Pursuant to the provisions of the Federal Power Act, the Federal Power Commission evaluates headwater benefits accruing to the Alabama Power Company on a regular basis to determine what proportion, if any, of project annual charges are creditable for headwater benefits.

TABLE 22
PERTINENT DATA
CARTERS LAKE PROJECT

Item	Unit	Multiple-Purpose Project
MAIN DAM		
GENERAL		
Location - Coosawattee River, GA	mi	26.8
Drainage area	Sq. mi.	376
RESERVOIR		
Reservoir Elevation:		
Top of design pool	Ft. msl	1107.3
Top of flood-control pool	do	1099.0
Top of power pool	do	1072.0
Bottom of power drawdown	do	1022.0
Top of conservation pool	do	1022.0
Stream bed	do	665.0
Normal tailwater	do	690.0
Reservoir area:		
Top of design pool	Ac.	4200
Top of flood-control pool	do	3880
Top of power pool	do	3230
Bottom of power drawdown	do	2196
Top of conservation pool	do	2196
Storage capacity:		
Total	Ac. ft.	472,800
Flood control	do	95,700
Power drawdown	do	134,900
Dead (conservation)	do	242,200
DAM AND APPURTENANCES		
Dam:	Rockfill	
Type	Gravity	
Elevation, top of dam	Ft. msl	1,112.3
Length	do	1,950
Height	do	445

TABLE 22 (cont'd)
PERTINENT DATA

Item	Unit	Multiple-Purpose Project
Spillway:		
Type		Controlled
Elevation of crest	Ft. msl	1,070
Top of crest gates	do	1,106
Outlet conduits:		
Type	each	Gate-controlled through spillway monoliths
Number	#	5
Dimensions	Ft.	42' x 36.5'
Penstocks:		
Number	#	4
Diameter	Ft.	18'
Intake gates:		
Type	each	Tractor
Dimensions	Ft.	14' x 20.5'
POWER PLANT		
Powerhouse:		
Type	each	reinforced concrete
Dimensions	Ft.	230' x 127'
Installed capacity:		
Number of generating 1/ units (initial)	#	4
Number of generating units (ultimate)	#	4
Capacity of units	KW	125,000
Installed capacity (initial)	do	500,000
Installed capacity (ultimate)	do	500,000
Schedule of initial operations:		
1st unit		July 1975
2nd unit		November 1975
3rd unit		September 1977
4th unit		June 1977

1/ Two units are conventional and two are reversible (pump back).

TABLE 22 (cont'd)
PERTINENT DATA

Item	Unit	Multiple-Purpose Project
House units:		
Number of generating units	#	None
Capacity of each	KW	None
POWER DATA		
Operating head:		
Normal maximum power pool (gross)	Ft	394
Normal minimum power pool	do	344
Average gross head	do	380
Net regulated flow:		
Average critical hydro period	C.F.S.	620
Power available:		
Continuous power, critical hydro period	KW	22,400
Minimum peaking capability (initial)	do	500,000
Minimum peaking capability (ultimate)	do	500,000
Interruptible capability (initial)	do	500,000
Interruptible capacity (ultimate)	do	500,000
Primary Energy per year	kwh	195,826,000
Secondary average annual (initial) 1/	do	228,696,000
Secondary average annual (ultimate) 1/	do	228,696,000
Average annual energy (initial)	do	424,522,000
Average annual energy (ultimate)	do	424,522,000
Load factor (streamflow)	do	.0447
Load factor (streamflow + pumping)		.0969
Pumping energy required	do	335,790,000

1/ Pump energy

TABLE 22 (cont'd)
PERTINENT DATA

Item	Unit	Multiple-Purpose Project
REREGULATION DAM		
GENERAL		
Location - Coosawattee River, GA	mi	25.04
Drainage area	sq. mi.	530
RESERVOIR		
Maximum storage pool elevation	ft. msl	698.0
Minimum pool elevation	ft. msl	665.5
Area at maximum storage pool	ac	870
Area at minimum pool	ac	60
Usable storage	ac. ft.	19,300
Dead storage	ac. ft.	290
SPILLWAY		
Total length including end piers	ft.	208
Net length	ft.	168
Elevation of crest	ft. msl	662.5
Type of gates	each	Tainter
Number of gates		4
Length of gates	ft.	42
Height of gates	ft.	36.5
Elevation of top of gates in closed position	ft. msl	699.0
Elevation of low steel of gates in fully open position	ft. msl	700.81
Elevation of trunnion	ft. msl	675.0
Elevation of access bridge	ft. msl	717.0
Elevaton of stilling basin apron	ft. msl	647.5
EARTH DIKES		
Top elevation	ft. msl	703.0
Length	ft.	2,855
Top width of right dike	ft.	32
Top width of left dike	ft.	12
Side slopes	V to H	1 on 3

In evaluating the cost of providing water supply from the Carters project, the highest value produced by four separate analyses must be identified. The four analyses result in a value for: power revenues foregone, power benefits foregone, replacement cost of power, and updated cost of reallocated storage. All four analyses were performed with the results shown in Table 23. The Energy and Capacity values used in the analyses were as follows: revenues foregone were computed with Southeastern Power Administration (SEPA) contract values (Oct 87-Oct 88), energy $4.88/MWH, capacity $19.18 KW/YR; replacement cost of power was computed with market values from Alabama Power Company (1987), energy $21.86/MWH, capacity $62.16 KW/YR; benefits foregone were computed using values from the Federal Energy Regulatory Commission (FERC) for the Carters Lake Project and were based on October 1987 cost levels with a combustion turbine oil fueled plant, energy $101.20/MWH, capacity $40.45 KW/YR; updated cost of reallocated storage was computed using construction costs and indexing to January 1987 price levels. The highest value identified, and therefore the cost of water supply from Carters Lake Project, was the power benefits foregone at an annual cost of $7,460,700.

SUMMARY

31. Findings. Extensive investigations into the feasibility of numerous possible multipurpose project configurations and sites were conducted during this study. Detailed analyses of the modified plan for the original Dalton Lake site, and the reformulated plan for the Mitchell Bridge site, were both performed using data and evaluation methodologies which strongly favored economic feasibility. All economic evaluations of the considered multipurpose plans resulted in benefit-to-cost ratios far below unity (costs exceeded National Economic Development benefits). The results of analyses performed for the three major plans considered are shown in Table 24.

In addition to the lack of economic feasibility demonstrated by these multipurpose plans, it is pertinent to point out that each would also result in significant adverse environmental impacts. During the conduct of this study, two species of small fish, which inhabit the study area, were listed in the Federal Register as endangered. Both species, the amber darter and the Conasauga logperch, are found in the Conasauga River and its tributaries. Their habitat in the river occurs along a reach extending from the rivers headwaters, in Tennessee, to a point downstream from the original Dalton dam site. Thus, all engineeringly suitable lake and dam sites on the river lie within the critical habitat of these species. In addition to the two species listed, another small fish, the trispot darter, may also be designated as endangered in the near future. This species also occurs in Conasauga River reaches, which would be impacted by the considered multipurpose plans. Critical habitat must be avoided; and the listing of these species, combined with the lack of economic feasibility, adds strength to the finding that a multipurpose project on the Conasauga River is currently not feasible.

TABLE 23

BASIS FOR DETERMINING WATER SUPPLY COSTS
CARTERS LAKE PROJECT, GA

HYDRAULIC FACTORS

- Usable Storage

Flood Control (elev 1099-1072)	95,700 AF
Hydropower (elev 1074-1022)	141,400 AF
Total Usable Storage	237,100 AF

- Flow Data

Prime Discharge	424 CFS
Water Yield(424 CFS x 1.98 AF/CFS/DAY x 365 DAYS/YR)	306,424 AF/YR

HYDROELECTRIC POWER DATA

. Prime Capacity (critical hydro period)	22,400 KW
. Dependable Capacity (install cap. 4 units @125,000)	500,000 KW
. Primary Energy (annual)	195,826,000 KWH
. Secondary Energy (Ave. Annual)	228,696,000 KWH
. Total Energy (avg. annual primary & secondary)	424,522,000 KWH
. Plant Factor (streamflow-no pumpback)	.0448
. Plant Factor (streamflow & pumpback)	.0969
. Average Plant Efficiency (1985-1987)	90.5%
. Maximum Gross Head	394 FT.
. Minimum Gross Head	344 FT.
. Average Gross Head	380 FT.
. Average Net Head (380-4.8)	375 FT.

WATER SUPPLY NEEDED

. Requested Supply	51 MGD
. Withdrawal Rate (from main pool)	79 CFS
. Storage Volume Required (79 x 1.98 x 365)	57,093 AF

DERIVATION OF POWER GENERATION FOREGONE

- Dependable Capacity Foregone

  $\frac{79\ \text{CFS}}{424\ \text{CFS}}$ x 500,000 KW = 93,160 Kilowatts per year

- Energy Foregone

  $\frac{79\ \text{CFS}}{424\ \text{CFS}}$ x 195,826 MWH = 36,486 Megawatt hours per year

REVENUES FOREGONE (SEPA)

- Capacity - $19.18 KW/YR x 93,160 KW = $1,786,808
- Energy - $4.88 /MWH x 36,486 MWH/YR = $178,051
- Total Revenues Foregone = $1,964,860 Annually

REPLACEMENT COST OF POWER (MARKET-APC)

- Capacity - $62.16 KW/YR X 93,260 KW = $5,790,825
- Energy - $21.86/MWH X 36,486 MWH/YR = $797,584
- Total Replacement Cost of Power = $6,588,410 Annually

TABLE 23 Cont'd

BENEFITS FOREGONE

- Capacity - $40.45KW/YR X 93,160 KW = $3,768,322
- Energy -$101.20/MWH X 36,486 MWH/YR = $3,692,383
- Total Benefits Foregone = $7,460,700 Annually

UPDATED COST OF STORAGE

- Original Cost of Carters Project:

Joint-Use Facilities	-	$ 45,325,800
Specific Facilities	-	$ 60,818,000
Total Construction Cost	-	$106,143,800

- Updated Cost of Carters Project:

CWCCIS Index for Mid-Point of Construction 1/ - 116.000
CWCCIS Index for January 1987 - 397.109
Ratio of Indices 397.109/116.000 = 3.42
Joint-Use Facilities $45,325,800 x 3.42 = $155,014,000
Specific Facilities $60,818,000 x 3.42 = $207,998,000
Total Updated Construction Cost = $363,012,000

- Derivation of Joint-Use Investment Costs for Water Supply Storage:

Water Requested	57,093 Acre-Feet
Storage in Power Pool	141,400 Acre-Feet
Total Usable Storage	237,100 Acre-Feet
Annual Water Yield 2/	306,424 Acre-Feet

$\frac{57{,}093 \text{ AF}}{306{,}424 \text{ AF}} \times 141{,}400$ AF = 26,346 AF (NOTE: less than 15% of total usable storage or 50,000 AF)

$\frac{26{,}346 \text{ AF}}{237{,}100 \text{ AF}} \times \$155{,}014{,}240$ = $17,224,800 (total cost storage allocated to water supply of 51 MGD)

1/ Construction started in November 1962 with the project becoming available for flood control in November 1974. Hydropower units were installed on July 1975, November 1975, June 1977, and September 1977. The entire project was functional in September 1977. Thus, the mid-point of the construction period was taken as January 1969 (since the last two hydro units came on line 2 years after the project was essentially in service November 1975).

2/ Daily yield = 424 CFS (424 CFS/DAY x 1.98 AF/CFS x 365 DAYS/YR = 306,424 AF/YR)

TABLE 23 Cont'd

- Derivation of Annual Cost for Water Supply Storage:
  Annual Charge for Repayment of Investment Cost of $17,224,800 at 10.693 Percent Interest Rate 3/ over a 50-year period.
  $17,224,800 x 0.10760 = $1,853,380

  Operation, Maintenance and Replacement Costs Apportionment (estimated)
  $\frac{26,346 \text{ AF}}{237,100 \text{ AF}}$ X $509,700 = $56,640

- Total Updated Annual Cost of Reallocated Storage.

Annual Investment Cost -	$1,853,380
O&M, Major Replacement Cost -	56,640
TOTAL ANNUAL COST	$1,910,020

3/ Interest Rate for FY 87 from EC 1105-2-177 dated 24 July 1987 (FY 87 Reference Handbook).

TABLE 24
SUMMARY OF MULTIPURPOSE PLANS
ECONOMIC EVALUATION

Plan Description	Benefit-to-Cost Ratio
Original Dalton Lake Plan (without recreation benefits, and July 1967 prices)	0.45
Modified Dalton Lake Plan (October 1981 prices)	0.54 1/
Mitchell Bridge Site (October 1986 prices)	0.66 1/

1/ Costs used to compute these B/C ratios did not include costs for cultural resource preservation or wildlife mitigation (both would be significant cost items).

32. Conclusions. No further consideration of multipurpose projects on the Conasauga River is warranted. Significant changes in the projected future environmental and economic conditions of the study area would be required to enhance potential project feasibility. The Dalton and Chatsworth areas additional water needs could be met through the implementation of one of the previously described single-purpose water supply alternatives.

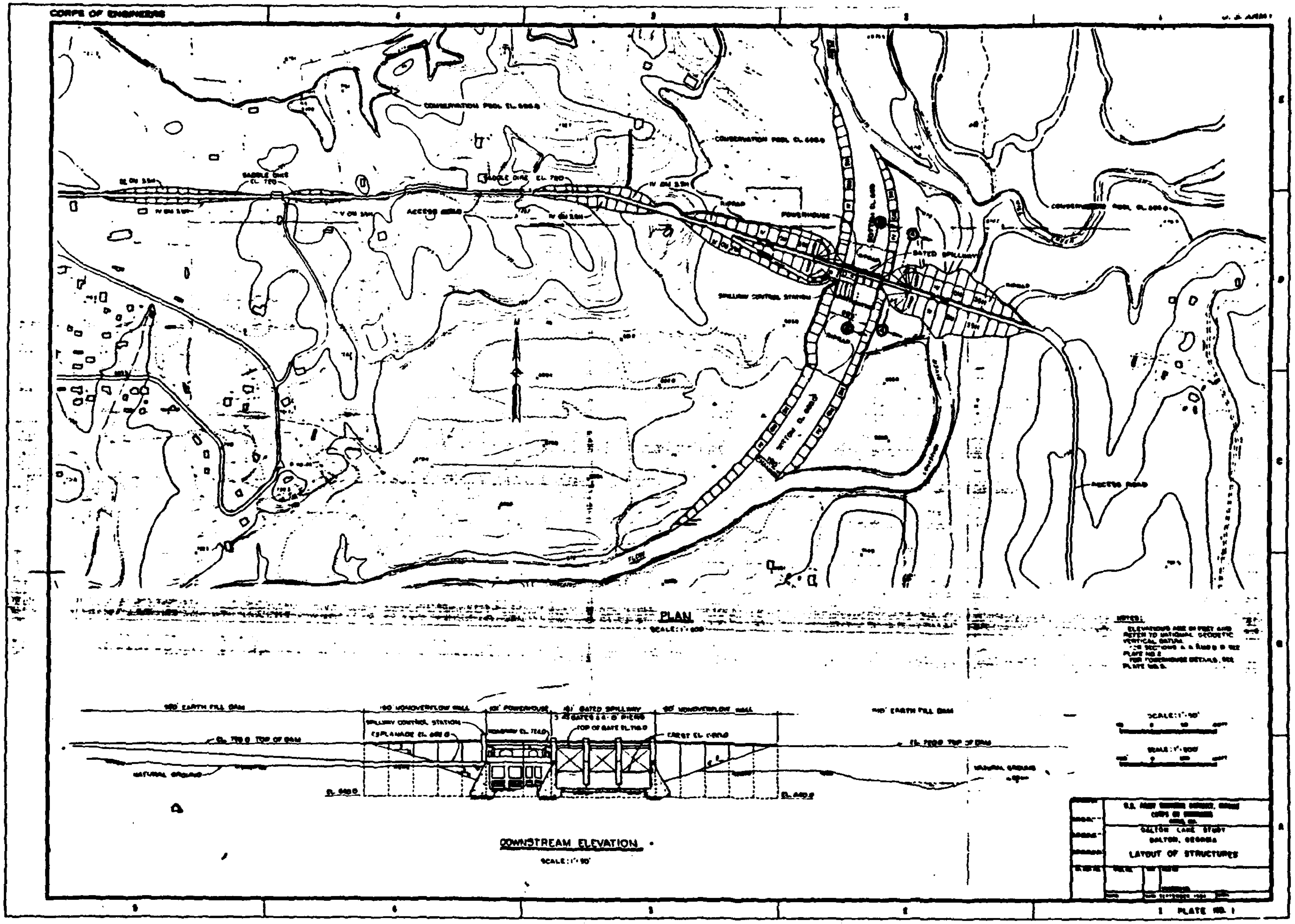
Multipurpose plans evaluated for this study were sized to contain enough storage to provide for a total study area need of 51 MGD in the year 2030. The 51 MGD accounted for not only the 2030 projected 14 MGD

deficit, between present dependable supply and total future need, but also recognized that the bulk of present supply is currently withdrawn from the Conasauga River. More specifically, the storage included in any multipurpose project on the Conasauga River would have to provide the existing level of river flow utilized for water supply, and also the future additional needs. Therefore, if the 14 MGD deficit (2 MGD for Chatsworth, and 12 MGD for Dalton) were provided from a source other than the Conasauga River, the existing dependable supply could continue to be utilized. Preliminary analyses indicate the least costly source for additional water supply to the Dalton-Chatsworth study area would be from storage in the existing Carters Lake Project. Provision of 14 MGD (51 MGD-37 MGD present dependable supply), through the use of the Carters Lake Project, would require reallocation of about 15,700 acre-feet of storage. This volume represents about 7 percent of the total usable storage in the project (237,100 acre-feet), or about 6 feet on the area-capacity curve below elevation 1020 feet NGVD.

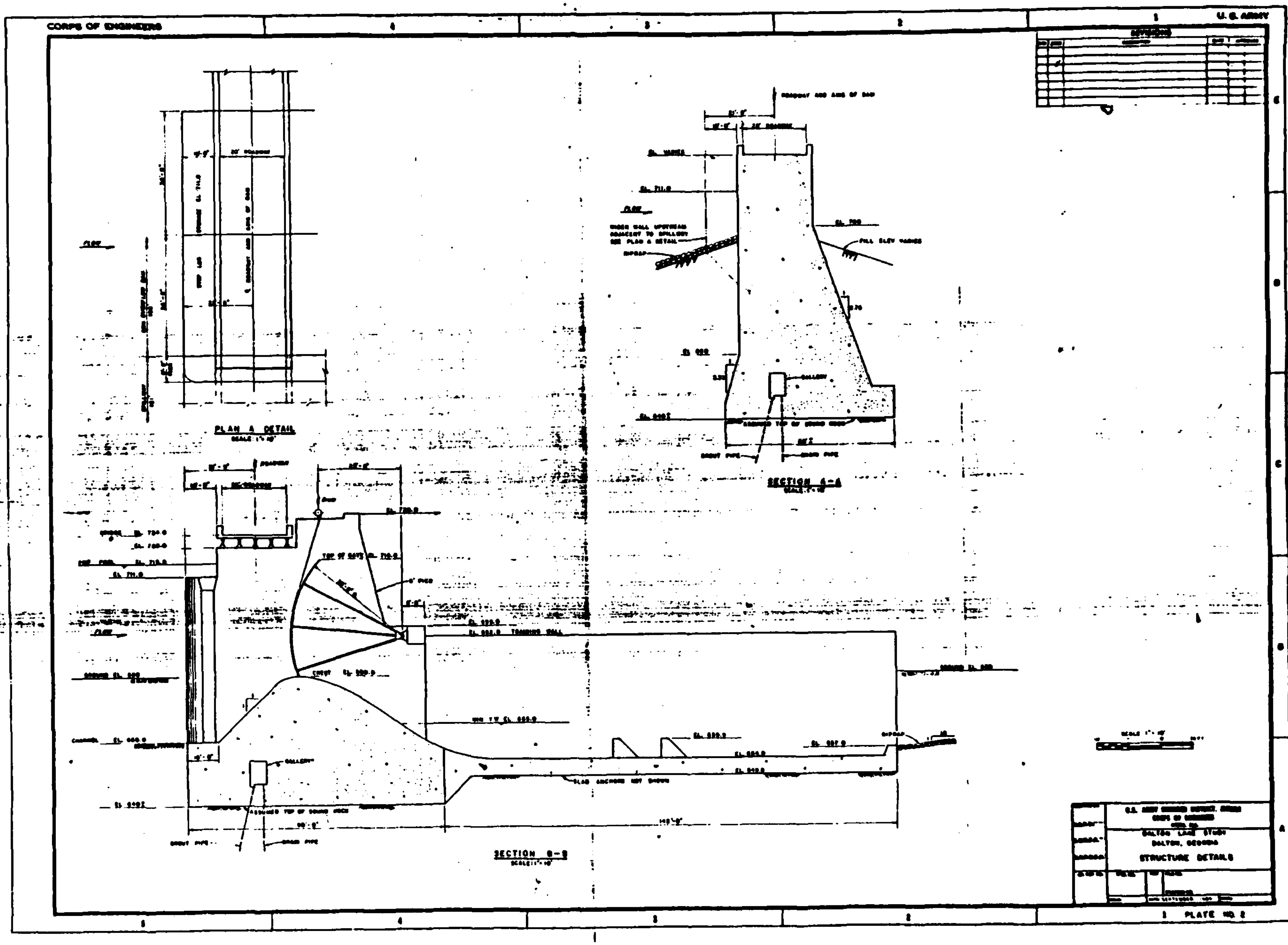
As has been stated, the growth and continued prosperity of the Dalton-Chatsworth area is integrally linked to the cost and availability of quality sources of municipal and industrial water supply. The Corps recognizes this fact, and has worked closely throughout this study with local interests, and representatives of state government, in an effort to provide useful information concerning the water resources of the Upper Coosa River Basin. Through these efforts the Georgia Department of Natural Resources has been provided a microcomputer based data inventory and analysis system, which will be of significant utility in the formulation and evaluation of regional water resource management alternatives. Additionally, many of the analyses, performed as part of this study, will provide particularly useful information when responding to potential drought situations in the region.

33. Recommendation. It is recommended that no further studies be undertaken for the Dalton Reservoir Project as authorized for Phase I studies in the Water Resources Development Act of 1974, PL 93-251, at this time.

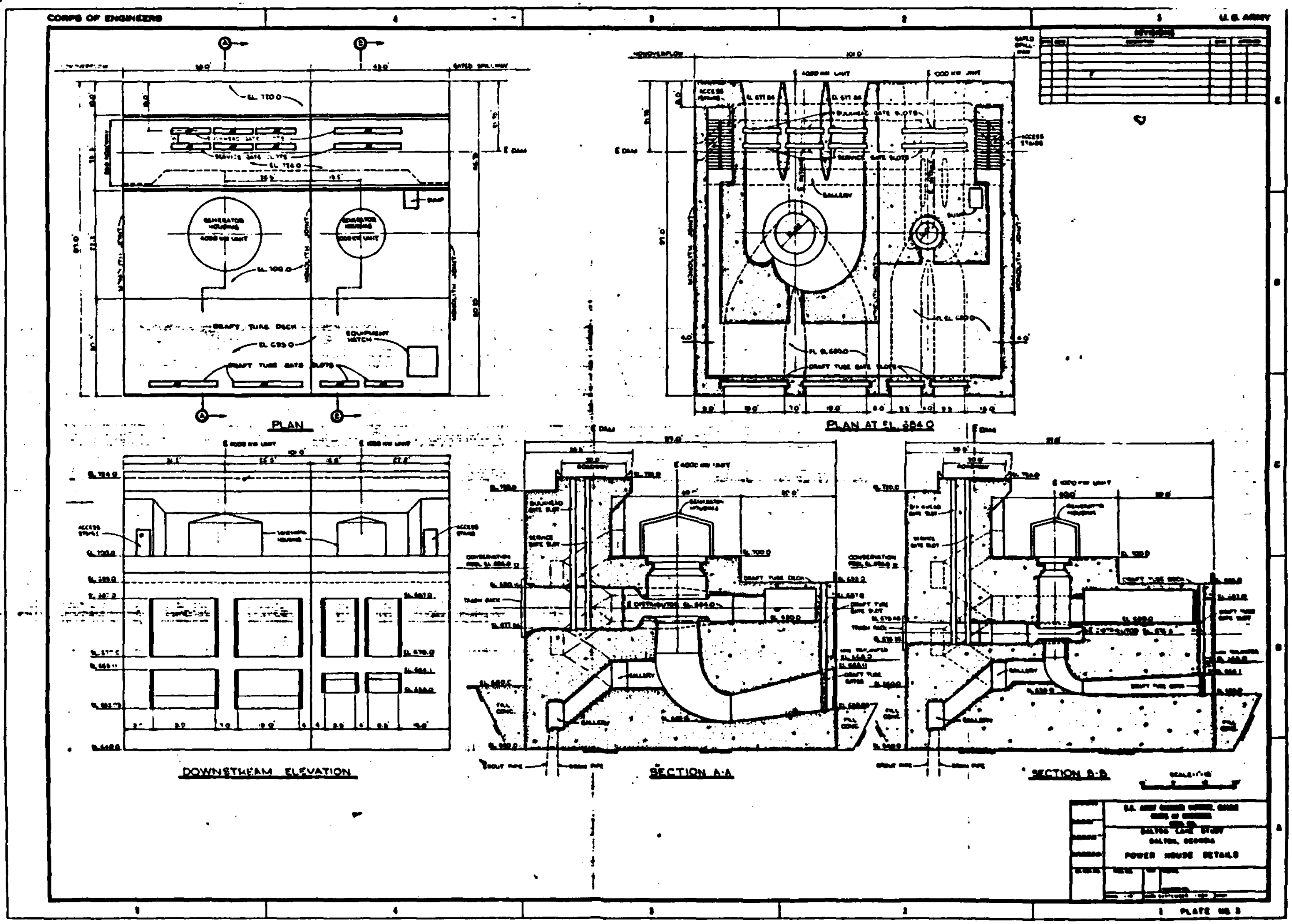
Larry S. Bonine
Colonel, Corps of Engineers
District Engineer

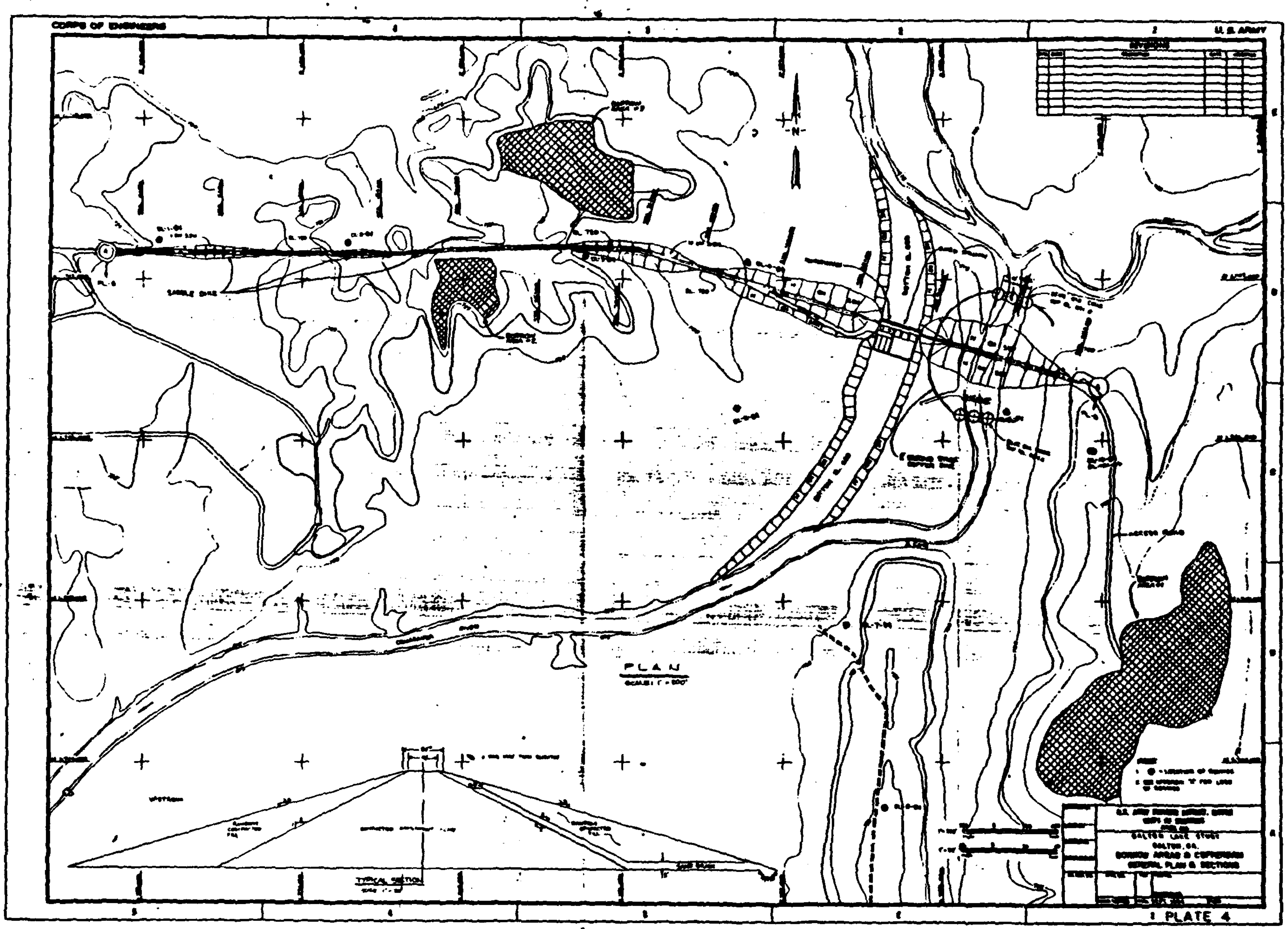


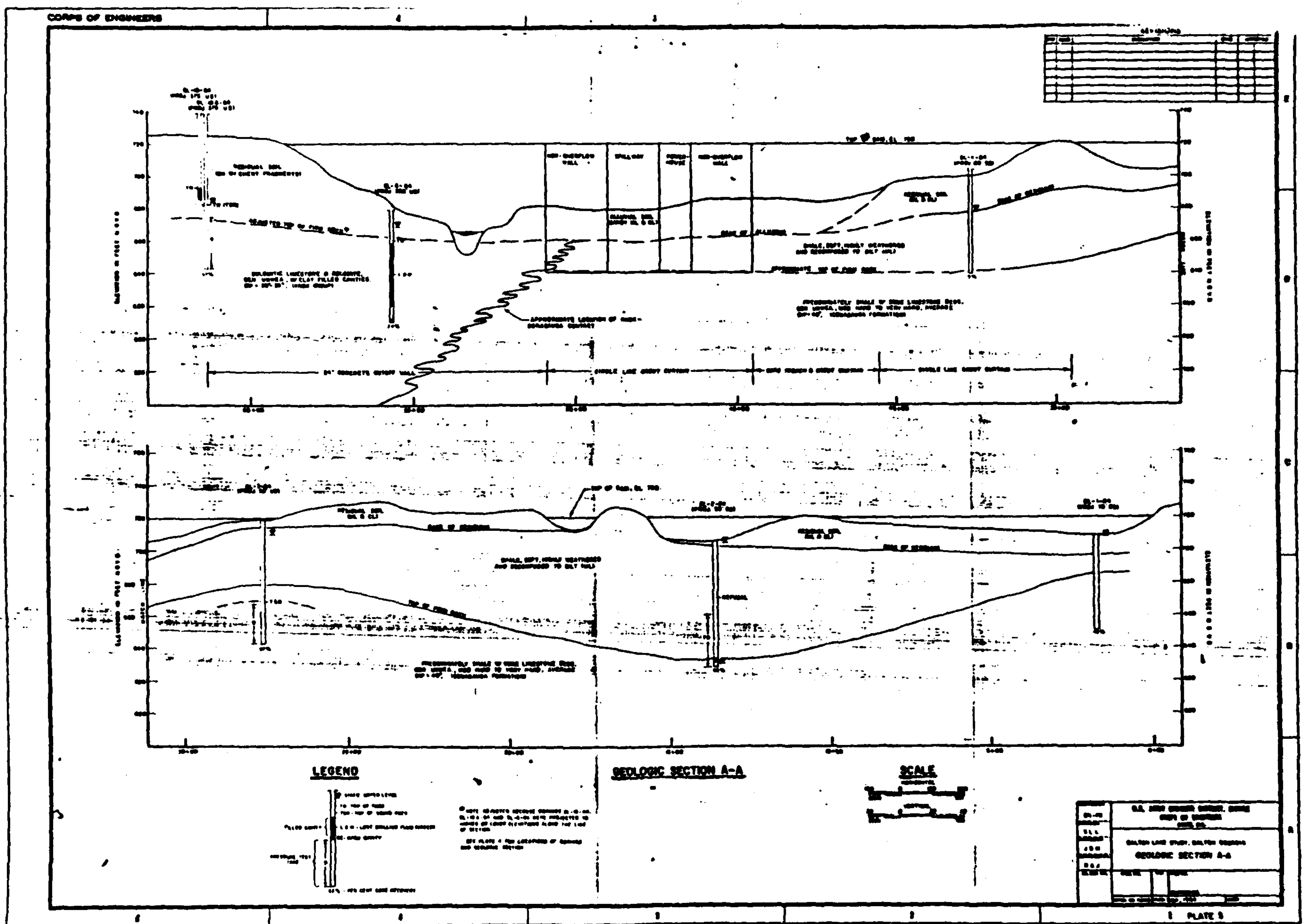
CORPS OF ENGINEERS
U. S. ARMY
CONSERVATION POOL EL. 680.0
SADDLE DIKE EL. 720
ACCESS ROAD
POWERHOUSE
GATED SPILLWAY
SPILLWAY CONTROL STATION
FLOW
PLAN
NOTES:
ELEVATIONS ARE IN FEET AND REFER TO NATIONAL GEODETIC VERTICAL DATUM.
FOR SECTIONS SEE PLATE NO. 2
FOR POWERHOUSE DETAILS, SEE PLATE NO. 3.
EARTH FILL DAM
NONOVERFLOW WALL
POWERHOUSE
GATED SPILLWAY
SPILLWAY CONTROL STATION
ESPLANADE EL.
TOP OF GATE EL.
CREST EL.
EL. 720.0 TOP OF DAM
NATURAL GROUND
DOWNSTREAM ELEVATION
SCALE: 1" = 50'
U.S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS
DALTON LAKE STUDY
DALTON, GEORGIA
LAYOUT OF STRUCTURES
PLATE NO. 1



CORPS OF ENGINEERS
U. S. ARMY
PLAN & DETAIL
SECTION A-A
SECTION B-B
DALTON, GEORGIA
STRUCTURE DETAILS
PLATE NO. 2


CORPS OF ENGINEERS
U.S. ARMY
PLAN
PLAN AT EL. 584.0
DOWNSTREAM ELEVATION
SECTION A-A
SECTION B-B
GENERATOR HOUSING
EQUIPMENT HATCH
DRAFT TUBE GATE SLOTS
SERVICE GATE SLOTS
BULKHEAD GATE SLOTS
MONOLITH JOINT
ACCESS STAIRS
GALLERY
GATED SPILLWAY
DALTON LAKE STUDY
DALTON, GEORGIA
POWER HOUSE DETAILS
PLATE NO. 3


CORPS OF ENGINEERS
U.S. ARMY
PLAN
TYPICAL SECTION
DALTON LAKE STUDY
DALTON, GA.
GENERAL PLAN & SECTIONS
PLATE 4



CORPS OF ENGINEERS
LEGEND
GEOLOGIC SECTION A-A
SCALE
PLATE 5

END
DATE
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